MODEL AIRPLANE NEWS

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—page 72

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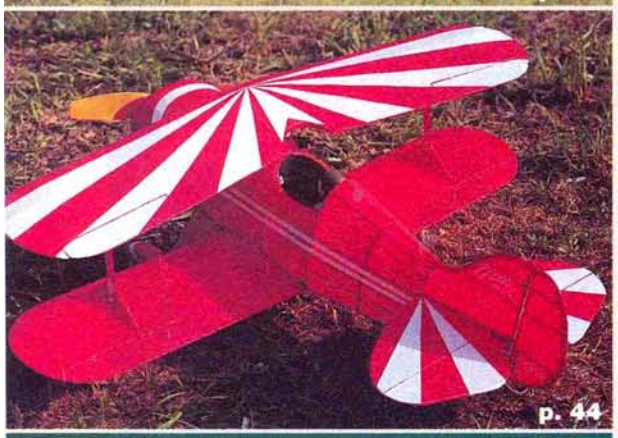
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***ON THE COVER:** Frank Buzduhanov's own-design 1930 Fleet bipe smokes through the skies at the Chicagoland Festival of Giants in St. Charles, IL (photo by Debra Sharp).*

***ON THIS PAGE:** top—getting into helicopters is both fun and challenging; center—Bill Brown of Naperville, IL, works on his scratch-built Fokker D-VII at the Chicagoland Festival of Giants (photos by Debra Sharp); bottom—S.M.A.L.L., in Little Rock, AR, is where lovers of small planes gather. Come along and see the fun (photo by Larry Marshall).*

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EDITORIAL

by GERRY YARRISH

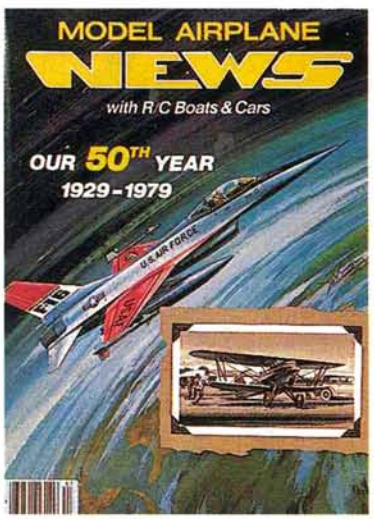
REMEMBERING JO KOTULA

1910—1998

JO KOTULA was a very talented aviation artist known to model airplane enthusiasts for his dramatic cover paintings that graced the covers of *Model Airplane News*. Jo also enjoyed painting landscapes and sketching figures, but it was the "boxwrap" art he painted for Aurora plastic models that made him famous.

In an online article from http://airliners.viamall.com/airliners/gensym-16.html, "Airliner Model Kits—An Inside Look at One of the World's Premier Airliner Kit Collections," avid model collector and world-class aviation artist Craig Kodera says of Jo's work:

"Jo Kotula (Aurora) painted the moodiest, most intoxicating images using contrast of color and lighting that were so evocative ... even ominous for military aircraft. The kits themselves were not that great, but those box tops would get you every time. You would see them in the store and just have to have 'em!" The images that Jo painted for *Model Airplane News* were equally awe-inspiring; they included his July 1979 cover art of a General Dynamics F-16, which Air Age Publishing commissioned for its 50th anniversary issue. Jo's last contribution to *Model Airplane News* was a pair of British S.E. 5a biplanes (pages 62 to 63) in the March 1985 issue.



July 1979

November 1963

In 1986, Jo co-founded the American Society of Aviation Artists, a very well-known group that has inspired and recognized the talents of an entire generation of aviation artists. Jo's (and the Society's) goals were and are the betterment of the aviation artist's profession and to affirm standards of professionalism, authenticity and artistic quality in aviation art. In so doing, the society has brought together artists from all over the world who share an interest in documenting the history of aviation for the enjoyment and education of the general public—an honorable legacy for any man.

Before he finished high school,

June 1932

Jo ventured west to broaden his artistic talents and soon demonstrated proficiency in the use of gouache, casein, acrylic and oil mediums. Shortly thereafter, the demand for aviation illustrations—including airline, military and business aircraft—seemed tailor-made for the then aspiring artist.

In 1936, Jo acquired his pilot's license at Roosevelt Field, and his interest in aviation safety drew him into the study of high-lift airfoil design and lift-augmentation devices; he became very interested in ways to avoid (or at least minimize) aircraft crash injuries. After many conferences with Hugh DeHaven of Cornell Medical Research, Jo conceived the idea of using inflatable air bags. Drawings of his concept were published in *Air Facts* magazine in 1943.

As a writer, I try to paint attractive pictures with my words. I find it difficult, however, to adequately render a complete picture of this gentle and talented human being. To quote his autobiography: "I sincerely hope I have made a contribution to this tradition of aircraft painting." I think that this elder statesman of American aviation art accomplished his task in the broadest spectrum of color.

AirSCOOP

by CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

GIANT Corsair

When Top Flite came out with an IMAA-legal Gold Edition Mustang a year and a half ago, many wondered which in the Gold Edition series would be the next to get the "giant" treatment. Well, my friends, here it is—a beautiful 1/5.75-scale F4U Corsair. According to its manufacturer, this all-wood kit retains the engineering and quality that made the .60-size Corsair—and the entire Gold Edition series, for that matter—such big hits with modelers. For instance, its easy, self-aligning design not only allows the fuselage pieces to interlock along its length, but it also gives a rigid, lightweight structure and, of course, that distinctive Corsair shape. The entire model is fully sheeted and provides the scale builder with an excellent surface on which to lay the details. An ABS oil cooler and a four-piece cowl are included, and many other scale accessories are available to maximize the Corsair's authenticity, including cockpit interior kit, instrument panel and replica radial engine. Specs: wingspan—86.5 inches; wing area—1,344.5 square inches; weight—24 to 26 pounds; wing loading—41.5 to 44.4 ounces per square foot; engine required—2.5 to 4.25ci (41 to 70cc); radio required—6-channel with 10 servos (seven heavy-duty servos are recommended); designed for Robart's 90-degree rotating retracts (part no. ROBQ1655) and tail gear (ROBQ2230).

1/5.75-SCALE F4U

Great Planes Model Distributors, 2904 Research Rd., Champaign IL 61826-9021; (217) 398-6300; fax (217) 398-0008. fax (217) 398-1104.

K&B 4-stroke glow plug

For years, I've been passing hints in the direction of domestic manufacturers that they should produce a dedicated 4-stroke plug. The O.S. "F" is excellent for 4-stroke engines, but because of international tariffs on platinum, it is also expensive. K&B has taken a very close look at the special glow plug needs of 4-strokes and, in particular, it has worked on ways to keep the glow element hot during the intake cycle, during which the fresh charge of incoming fuel mix can over-cool the element and stall the engine. On K&B's new Four Stroke Special Length plug, an extended tip brings the element closer to the center of the combustion chamber, and that element is made of heavy-duty platinum that has been specially alloyed to ensure maximum heat retention (thermal conductivity). Add to this that the element's diameter, coil shape and number of turns are specific to 4-strokes, and you have a plug that was engineered and optimized for a single purpose—obtaining dependable performance from a 4-stroke engine. A few very reliable and unbiased sources have already related excellent performance. Rumor has it that the price will be about half of what we're accustomed to. Stay tuned for more on this exciting news.

K&B Mfg. Inc., 2100 College Dr., Lake Havasu City, AZ 86403; (520) 453-3030; fax (520) 453-3559.

OHIO R/C MONSTER

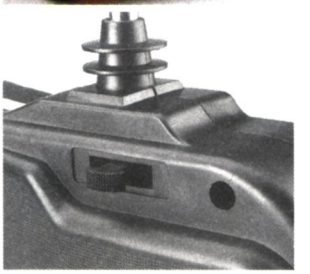
Thought you guys would like a quick look at this 33-percent Extra 300L—the latest in Ohio R/C's Monster Series, which, by the way, also includes a 97-inch CAP 232 and a 75-inch Ultimate. The kit is of all balsa and plywood construction and features lightweight construction, plug-in wings, airfoil-shaped tail surfaces, aluminum landing gear, fiberglass cowl and wheel pants, colored instrument panel, clear canopy and full hardware package. Specs: wingspan—102 inches; wing area—1,980 square inches; wing loading—25 ounces per square foot; length—90 inches; weight—22 to 25 pounds; engine requirements—3.7 to 5.8ci.

Ohio R/C Models, 4251 Lutheran Church Rd., Germantown, OH 45327; (513) 859-1660; fax (513) 859-7202.

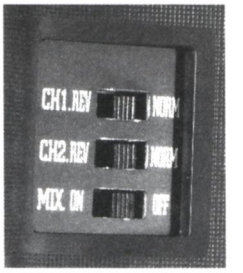
Focus 3 Single Stick

Like no other!

Did you ever want to build that special little project but couldn't find that special little radio for it? Hitec/RCD has introduced a revolutionary addition to its low-cost, high-quality radio-system line. The Focus 3 S.S. (single-stick) 3-channel AM could well be the perfect little radio for that special project. Basing it on the popular Focus 2, Hitec has added a proportional third channel to be used for electronic speed controls, throttles, flaps, or spoilers. But wait; there's more! This great little radio also features a channel 1 and 2 electronic mixing feature in the transmitter; this can be used for things like V-tail or elevons. I love it.



The standard version of the Focus 3 S.S. features channel 1 and 2 servo-reversing, HAS-03MB receiver, micro-harness and two HS-300 servos. A glider version is available on 72mHz only and features two HS-80 servos. Like all Hitec products, the Focus 3 S.S. has a one-year warranty against factory defects.



Hitec/RCD Inc., 10729 Wheatlands Ave., Ste. C, Santee, CA 92071-2854; (619) 258-4940; fax (619) 449-1002; website: www.hitecrcd.com.

Lanier 31.5% Staudacher

Designed by Jerry Smith, this big Staudacher S300 has been faithfully reproduced following the full-scale's factory 3-view drawings and is now being produced—just as faithfully, I'm quite sure—by Lanier RC. Intended expressly for sport and aspiring TOC pilots, this kit is not for beginner pilots, yet according to Bubba Spivey, owner of Lanier, those who are familiar with kit building will not have any trouble with it. He also says you will "marvel at the precisely fitting parts that are laser-cut and CNC-machined." The kit uses foam wing-cores that are sheeted only at the leading and trailing edges, and it uses capstrips to simulate ribs and keep the covering off the foam.

As he did with the Giles 202, Jerry employs (and Bubba executes) his famous slot-and-tab method of joining the fuselage sides to a top former; this ensures a perfectly straight fuselage. The sides, forward doublers and top formers are CNC routed to further ensure absolute building accuracy. The kit includes: all the necessary wood; plastic canopy, cowl and wheel pants; aluminum spar for the plug-in wings; and formed-aluminum gear. Hardware isn't included.

Specs: wingspan—96 inches; wing area—1,565 square inches; length—82.6 inches; weight—20 to 24 pounds; power required—3.2 to 5ci.

Lanier RC, P.O. Box 458, Oakwood, GA 30566; (770) 532-6401; fax (770) 532-2163.

KYOSHO CAP 232

The Breitling 232 is the second CAP in Kyosho's growing line of Super Quality Series ARFs. Finished after the full-scale Breitling 232, this is the only model licensed to carry this trim scheme. As with all the Super Quality Series ARFs, the Breitling 232 features light, strong, all-wood construction, and it comes out of the box covered with high-quality heat-shrink film. Scale touches include a one-piece ABS cowl and hand-painted wheel pants. Like the full-scale plane, the model 232 is fully aerobatic. Specs: wingspan—55 inches; wing area—558 square inches; weight—5.3 pounds; wing loading 20 ounces per square foot; engine required—.32 to .40 2-stroke or .48 to .53 4-stroke.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; fax (217) 398-1104.

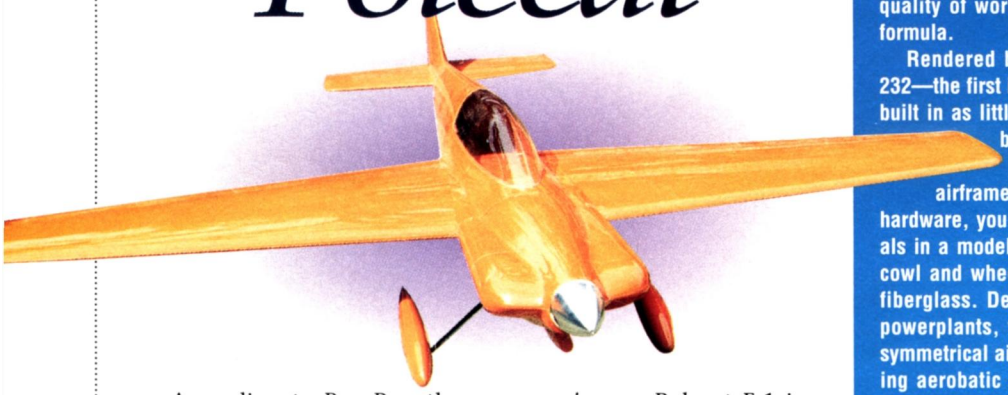
Yellow Aircraft to manufacture Starfire II

Yellow Aircraft is currently re-engineering many of its kits to bring them up to the latest standards and will also soon release several new jets for both ducted-fan and gas-turbine propulsion.

One addition is a new Starfire produced from the Starfire II molds and design that Yellow Aircraft purchased from Tom Cook of Jet Model Products. The new Starfire combines a fiberglass fuselage and other molded parts with balsa-sheeted foam-core wings and empennage. Like those on other Yellow Aircraft models, the Starfire's wings and stab are pre-sheeted with balsa. Also available are precision-machined retracts and other options for the kit, which is due for release in early 1999.

Yellow Aircraft, 203 Massachusetts Ave., Lexington, MA 02420; (781) 674-9898; fax (781) 674-2288.

All-composite Polecat



According to RacePro, the company's new Polecat F-1 is predictably easy to fly and takes only 25 to 60 hours to build. The level of prefabrication is shown in this picture. RacePro says that this lightweight model has fantastic in-flight tracking and can turn on a dime and land on a 300- to 400-foot runway! All the pieces are molded and jig-built for accuracy. For smooth, gap-free deflection surfaces, the kit features skin hinging. Aileron and elevator hinging is done during the wet lay-up process; the rudder is hinged conventionally. Wing mounts and stab are installed using a jig, and there are seven gelcoat colors to choose from; the Polecat needs no painting. Specs: wingspan—97 inches; length—85 inches; spinner—4.5 inches; weight—13 to 15 pounds.

RacePro Engineering, 12880 Quartz Mt. Rd. E., P.O. Box 445, Sutter Creek, CA 95685; (209) 267-1414; fax (209) 267-0923.

Hangar 9 Ultra Series CAP 232 ARF

The Ultra Series represents Hangar 9's effort to bring us much more than just another ARF. According to Hangar 9, quality of workmanship and materials is the Ultra Series formula.

Rendered big in 25 percent scale, the Hangar 9 CAP 232—the first in the Ultra Series—is IMAA-legal and can be built in as little as a week of evenings. It features nothing but the finest available building materials. With high-quality balsa and plywood for the airframe and genuine Goldberg Ultracote and Sullivan hardware, you would be hard pressed to use better materials in a model you scratch-built yourself. Even the painted cowl and wheel pants have been expertly fashioned from fiberglass. Designed for 1.20 2-stroke and 1.50 4-stroke powerplants, this CAP will do anything you ask of it. Its symmetrical airfoil and large ailerons give it pulse-quickening aerobatic abilities and precise control on takeoff and landing. Specs: wingspan—73 inches; length—67 inches; wing area—1,031 square inches; recommended engine—1.08 to 1.20 2-stroke, or 1.20 to 1.50 4-stroke.

Horizon Hobby Distributors, 4105 Fieldstone Rd. Champaign, IL 61821; (217) 355-9511.

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606 USA; email **man@airage.com**. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

LINDBERG SEARCHES FOR SPIRIT OF ST. LOUIS

I buy your magazine at the newsstand and I know that in every issue, you have a plan of the month. I was wondering if you have ever had an issue with the plans for a *Spirit of St. Louis*.

LINDBERG27@AOL.COM
[email]

We have no Spirit of St. Louis *plans in our catalog; sorry. Pat Tritle of Pat's Custom Models has a plan for a small (47-inch wingspan), Speed 400-powered model in his catalog; you can reach him at (505) 296-4511. Nick Ziroli Plans—(516) 467-1752—has a 1/4-scale (138-inch wingspan) plan available.* LM

CIRCUMFERENCE VS. AREA CALCULATIONS FOR PROPELLERS

I must disagree with the first section of "Multi-Engine Setup Techniques" in the September issue of *Model Airplane News*. In the attempt to claim a theoretical speed advantage for the twin-engine configuration, incorrect formulas were used. First, the area of a circle is calculated with pi x radius^2, not pi x diameter, which is for circumference. Therefore, Mr. Hahn's 2,000hp twin would have 23 percent more propeller disk area than the 2,000hp single. Thrust is not linearly proportional to the blade sweep area. The twin would have approximately 7 to 8 percent advantage in static- and low-speed dynamic thrust.

The maximum speed of a propeller-driven aircraft can be generalized as being dependent on three factors: power, propeller efficiency and frontal area drag. Power is identical. The twin's props would have their small efficiency advantage. However, it is clear that the single would have significantly less frontal area, while the twin would be penalized with separate engine nacelles in addition to a fuselage. The 2,000hp twin would possess greater climb and low-speed acceleration, while the single would not only be faster but presumably more maneuverable as well.

Other than these considerations, I enjoyed this article written by such a highly skilled craftsman and flyer.

ROBERT COATNEY
Macomb, IL

We received several letters like yours, Robert, and all of you are correct; we blew it. Such a basic algebraic error shouldn't have slipped through and into print, but it did; we apologize. You are indeed correct in your assessment of the proper equation for calculating the area of a circle.

Your second criticism sent me scurrying for the article and again, I have to concur: in that segment, Greg seems to imply that the words "speed" and "thrust" are synonymous, and that is clearly not the case.

Thanks to all who brought these problems to our attention. We print Robert's letter so that our readership might benefit from it as well. LM

TINY BUBBLES IN THE LINE

I am new to flying R/C models. As a senior citizen, I find this great fun, and I'm meeting a lot of nice folks. I have joined the local R/C club and the AMA. I have a new Sig Kadet Seniorita with an O.S. MAX .25 for power. It has a tube running from the muffler to the fuel tank. When I ran the engine for the break-in period, air bubbles kept running through the fuel line and into the carburetor. The fuel tank is built into the model and is not visible. The engine runs but seems to do so unevenly. Is this a problem? Will it be OK to fly it this way? One fellow said just to use it "as is." Thank you in advance for any help.

GENE PARRO
Eugene, OR

Gene, bubbles in the fuel line are not a good thing. Bubbles in the fuel supply lean out your mixture and, as you said, they cause the engine to run erratically. The bubbles come from either vibration or a pinhole(s) in the fuel line.

Vibration causes the fuel to "foam" within the tank, and this produces many tiny bubbles in the line. Large bubbles almost always come from a hole or a cut in the line. Do yourself a favor and change the lines and, even if you have to carefully cut an opening in the model, check the fuel tank. Foam rubber packed around the tank will greatly reduce fuel foaming. If this is an old model, I suggest completely replacing the fuel tank and fuel lines. If you avoid one deadstick landing, it will be worth the effort. GY

R/C SHUTTERBUG

I have been in R/C for almost 40 years and have found it a great hobby. In the last few years, I have taken up photography. As an employee of McDonnell Douglas, I have photographed full-size aircraft; now, for my own enjoyment, I am learning to photograph models—a somewhat difficult task.

I particularly liked your Joe Nall coverage; the model photography, especially in flight, was superb. The quality of your photography is always the greatest. To improve my modeling and flight photography skills, could you tell me what kind of camera equipment and techniques you use? Thanks for your help.

BEN LANTERMAN
Bridgeton, MO

Ben, many thanks for your kind critique of our photographs. Actually, most of my everyday photography (as in my B&W photos for the "Thinking Big" column) is done with a Nikon 5005 AF equipped with several different lenses. Mostly I use a 28—85 Nikkor 1:3.5—4.5 lens with a Tiffen 62mm Sky 1A filter (added just to protect the lens). For the lucky few flight shots I do get, I use a Nikon F5 with a Nikon ED AF 300 1:4 lens with a Hoya HMC 82mm UV filter. Before the F5, we used a Nikon 8008 with a fixed 300mm lens. With the 8008, I relied mostly on manual focus for flight shots, as its auto focus (AF) was way too slow. Now, with the F5, I use both manual and AF. AF helps with really fast jets and fighters, while I like to use manual for WW I biplanes, Piper Cubs and other slow "targets." I'm glad you enjoy the magazine, and I hope my explanation helps. GY

SEWN HINGES ADDENDUM

In my article on sewn hinges for control surfaces in the August '98 issue, I stipulated silk thread for the hinging medium. Actually, any of the currently popular threads—polyester, rayon, or nylon—will work just fine and are available in many shades to match almost any color scheme. I have used silk for years and did not realize that my supply was well over 30 years old! Sorry about that!

RANDY RANDOLPH

Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1998. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.

OLD RHINEBECK LOOK-ALIKE

Ken Bell of Fontana, WI, thought that his SE5a needed an adversary, so he built this Albatros DII from Tom Connor plans. Powered by a Saito .91, this 60-inch-span model weighs 9 pounds, 10 ounces and is covered with Clancy Aviation's Easytex fabric with Ultracote panel lines. The Albatros also features a Precision Fiberglass cowl, Gene Barton spinner and Williams Bros. guns and wheels. Controls are dual pull/pull on elevator and single pull/pull on rudder.

GIANT P-38J

Carey Hook of Burt, MI, says that a three-man crew is needed to start the engines on this big bird. Built from the Madden Models kit, the Ziroli-designed P-38J weighs in at 42 pounds and boasts a 114-inch wingspan. It uses Robart retracts, a Futaba radio system with 15 servos and two Zenoah G-45s for power.

X-1 PUSHER

"When they're set up right, canards are very stable, fast, anti-stall and aerobatic as well," says Larry Berger of Riverside, CA. Larry should know; he has built four of them so far. This one uses a .25 for power and has a fiberglass fuselage, foam-core wing laminated with .010 fiberglass, carbon-fiber tubes for spars and leading edges and molded one-piece main landing gear with D.B. foam tires. Larry adds that the 50-inch model performs extreme snap rolls.

HOWARD HUGHES RACER

Joe LeRoy of Las Vegas, NV, designed and built this 1/5-scale H-1 model from available data. Powered by a Moki 150 spinning a 16x10 propeller, the Ultracote-covered model weighs in at 14 pounds and has Robart air retracts and a fiberglass cowl. Joe writes, "It is very easy to fly, performs aerobatics easily and smoothly and has very good vertical performance and a slow landing speed."

FLYING RAZOR

Built from *Model Airplane News* plans, this Fokker EV was built by Billy Reider and is now owned by Brad Lewis of Norwalk, CT. The 56-inch-span model is covered with 21st Century Antique fabric and airbrushed with Tamiya acrylics and Perfect Paint flat clear. An O.S. .52 Surpass engine provides the power. Brad writes, "It has flown six times so far and looks great on a flyby."

BIG, BEAUTIFUL DOLL

This slightly modified .20-size House of Balsa P-51 was built by 15-year-old Jeff Sitarz of Oak Bank, M.B., Canada. The 43-inch-span model is covered in Ultracote and all the markings are handpainted. Jeff has this to say about his third plane and first scale project: "The scary part is that it resembles the full-scale aircraft, which I didn't think would happen, as I don't get any help building my airplanes ... I just kind of learned on my own." We're very impressed, Jeff.

FIRST DRAFT PICK

A true-blue Miami Dolphins fan, Norman Franzino of Royal Palm Beach, FL, built this Midwest CAP 232 and covered it in Ultracote with hand-drawn and -cut graphics. With an 80-inch wingspan, the CAP weighs 17½ pounds and is powered by a SuperTigre 3000 engine spinning an 18x10 Classic Series prop. We'll bet this model scores high at the field.

CLASSIC OLD-TIMER

Jerry Kinney of Jackson, MN, sent this photo of his friend and Windom Eagles Model Airplane Club president John Loken and John's KG2 4-channel old-timer. The model is covered with Dacron and dope and spray-painted with Krylon, and it's powered by an O.S. .90 4-stroke. Jerry writes, "John is not only a fine builder, but a person who can get much done, like a fine flying field and free water to keep the grass growing." Let's hear it for club presidents like John everywhere!

FRATERNAL FLYERS

Mitch Moffitt of Arlington, VA, sent this photo of himself and his brother Shawn (left) of Twin Falls, ID, and their 1/7-scale Top Flight Gold Edition warbirds. Shawn's MonoKote-covered P-51B is powered by a SuperTigre .90 and has functional flaps and Century Jet retracts. Mitch's P-40E is powered by an O.S. 1.20 Surpass and features split flaps, Century Jet rotating retracts and a homemade gunsight that's really an on/off switch. It's also covered with MonoKote with airbrushed camouflage and handpainted markings.

FOUR-WHEEL FLYER

Bill Weins of Vernon, B.C., Canada, says that although some may call him unorthodox for not building another scale or semi-scale ship, he has a blast flying this Porsche built from *RCM* plans. With the help of his daughter Cindy, Bill built the flying car in two weeks' time and now enjoys a "new dimension of flying." He writes that the O.S. 91-powered Porsche can do loops and rolls and is as nimble as a trainer. We think it gives a new meaning to the phrase, "Gentlemen, start your engines!"

Everyone on the flightline hustles to get ready for the next heat.

Team Extra pilot Dave Smith is behind the controls of this Kelly F1-D.

Golden State Unlimited

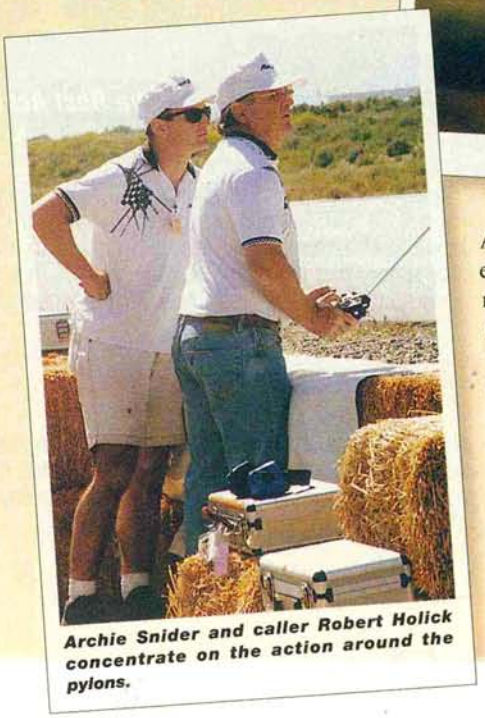
by SHERRY SUMMERS MARINE

"FIRE 'EM UP!" When flightline boss Steve Parola shouts this command, organized chaos follows. With a forceful flip of the props, four or five engines whine and cough before revving to life. The pilots make quick adjustments frighteningly close to the spinning propellers, while their assistants hug the planes against powerful static thrust. The turn callers wait safely behind hay bales in a whirlwind of smoke and straw.

When all the planes are in the air, the clock starts a 1-minute countdown. The big birds circle lazily in an attempt to disguise their strategies. At the 5-second mark, engines scream as all planes dive toward the start line in an attempt to take the early lead.

For six laps, the pilots focus on flying a steady course while the callers stand over their shoulders shouting "Ready, turn" instructions.

Fred Sattler's AeroSport AT-6 takes off.



Archie Snider and caller Robert Holick concentrate on the action around the pylons.

As the aircraft successfully rounds each pylon, a light flashes confirmation to the caller. If the airplane turns before it has reached the pylon, the pilot is penalized 10 seconds for the cut. Only three cuts are allowed per heat race.

There are six classes: Thompson Trophy, Biplane, AT-6, Formula 1, Unlimited and Experimental; the last two classes reach speeds of 240mph in the start dive.

Archie Snider of World Championship Air Racing, with the help of major sponsors Airtronics, Everex Computers and ZAP, opened this season of USRA-sanctioned giant-scale R/C racing with over 100 entries, numerous vendors and a large crowd of eager spectators. All basked in the perfect 80-degree California weather while they enjoyed fierce competition, spectacular mid-afternoon entertainment by full-scale aerobatic pilot Wayne Handley, good food and a shared enthusiasm for this growing sport.

For more information, contact the Unlimited Scale Racing Association at (281) 558-4191, or visit its website at www.usra-racers.org. For a videotape of this or earlier USRA races, contact Lloyd Lopez at (909) 680-1028.

Texans line up after leaving the fuel dock.

WINNERS

THOMPSON TROPHY

1	Hippy Cirelli	Scratch-built Caudron C-460
2	Cal Orr	Byron Gilmore
3	Tom Keating	Scratch-built Hughes H-1

FORMULA 1 GOLD

1	Ken McSpadden	RacePro GR-7
2	Bill Malo	BS Racing Polecat
3	Ben McBride	RacePro GR-7

BIPLANE

1	John Creagh	KT Aviation Mong
2	Fred Sargent	KT Aviation Mong
3	Ron Eisner	RacePro Pitts

EXPERIMENTAL

1	Fred Sattler	RacePro Lancair
2	Archie Snider	RacePro Lancair
3	Daniel Goldberg	RacePro Lancair

AT-6 GOLD

1	Shawn Everson	Aero Sport AT-6
2	Gene Barton	RacePro AT-6
3	Fred Burgdorf	RacePro AT-6

UNLIMITED

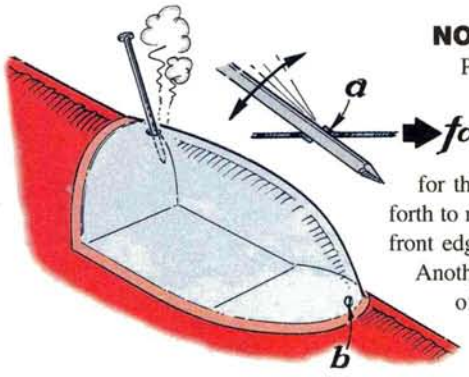
1	Ken Thornton	RacePro NA-50
2	Bruce Brown	Horndog Stiletto
3	Joe Reichlin	Saxton Stiletto

James Barton, son of Gene Barton of Black Bart Racing, waits for the nod to release Gene's RacePro Tsunami.

Hints & KINKS

by JIM NEWMAN

Model Airplane News *will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o* Model Airplane News, *100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.*



NON-FOGGING CANOPY

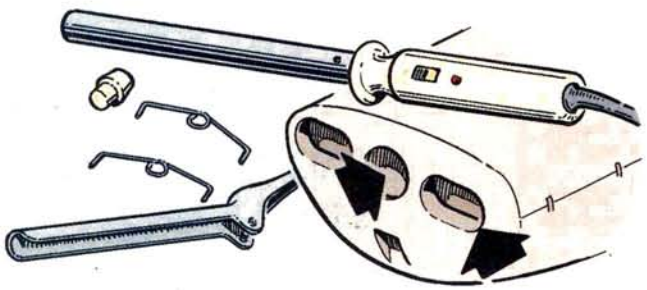
Prevent your canopy from fogging up by drilling a small hole in it at the top and toward the back. A hot nail works well for this because you can tilt it back and forth to mold a small lip or spoiler (a) at the front edge of the hole for better extraction. Another small hole (b) at the front edge of the canopy allows air to flow through; just be sure the canopy will not collect exhaust residue.

Stephen Kelley Jr., Auburn, MA

ATTRACTIVE TOOLS

To magnetize your ball drivers and screwdrivers, stroke them in one direction with a magnet. Now your screws will be held on the ends of the tools when you lower them into deeply recessed holes.

Bob Moffat, Unity, SK, Canada



MAGIC WAND

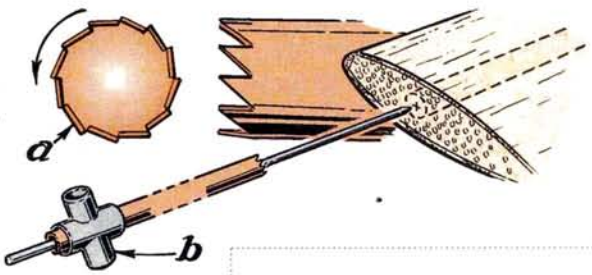
Pick up an old, working curling iron, then discard all the hardware and the plastic end plug until you are left with just the wand. The high-temperature setting is approximately the same as the medium setting of popular covering irons and is very useful for sealing down film inside air intakes, etc.

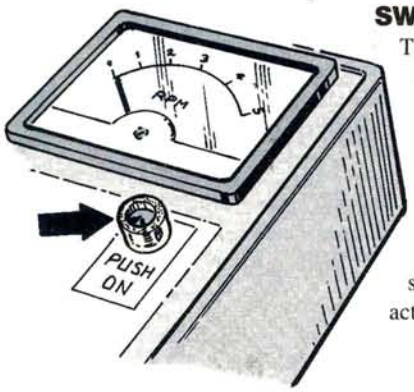
Allain Hale, North Port, FL

SUCH A BORE

This simple probe and boring tool ensures reasonable accuracy when boring a wing-core for servo leads or pushrods. The ⅛-inch (3mm) sharpened music-wire probe locates the servo cutout, then is left in place and used to guide the ½-inch (13mm) boring tool, which can only drift off course 3/16 inch (5mm) at most. The tool was copper tube into which teeth were filed. The teeth (a) were twisted slightly to provide some "set" to cut clearance for the tube. The "T" (b) is soldered on to make a handle. Joe says this also works well on a built-up balsa rib wing.

Joe LeTourneau, Brantford, Ont., Canada

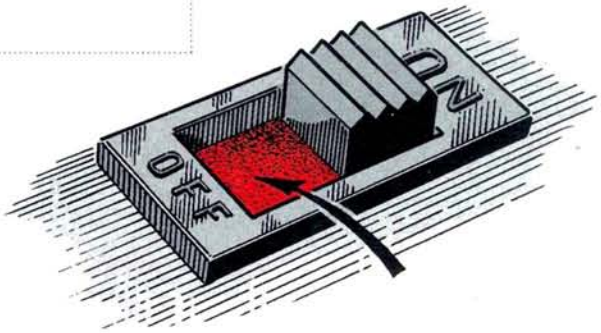




SWITCH GUARD

To prevent push-button switches from being accidentally turned on, add a short length of fuel tubing over the button. Now the button can't be turned on accidentally, and a healthy push will squash the tube enough to activate the device.

Tex Gehman, Winnipeg, MB, Canada

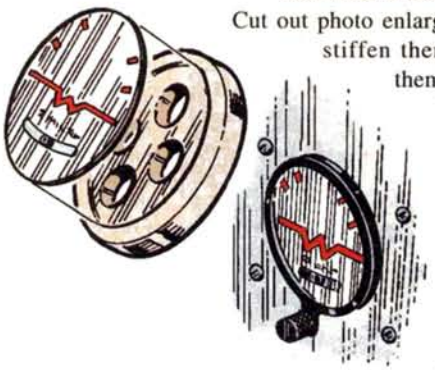


VISIBLE ON

When your transmitter switch is in the "on" position, paint the recessed area below the switch with a quick-drying, bright red paint, or apply a bright, sticky-back trim film square. This will give you a better visual indication that the transmitter has been left on.

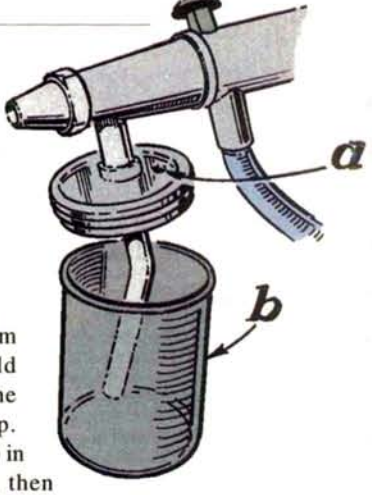
Fred Heddleson, Oak Ridge, TN

BUTTON-DOWN DETAIL



Cut out photo enlargements of instruments, stiffen them with CA, then stick them to slightly larger shirt buttons. Paint the edges and dummy bezel matte black. For a glass look, apply clear varnish or thin CA to the dials, then mount them to your panel with glue, drop screw heads and appropriate setting knobs.

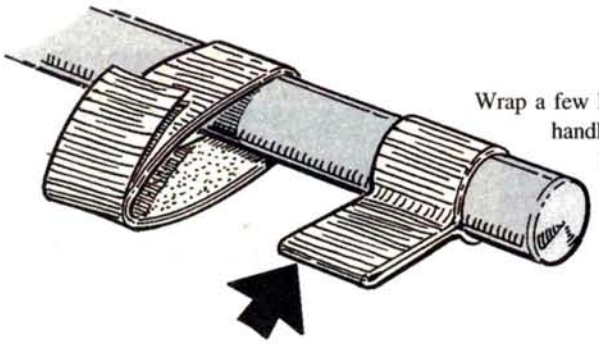
Brian Swartz, Herkimer, NY



PAINT CANISTERS

A plastic 35mm film container will hold more paint than the usual airbrush cup. Drill a small hole (a) in the cap to vent it, then make it force-fit on the dip tube. The canister (b) is spill-proof with a snap-on cap. Jim painted a 90-inch (228cm) model with this rig!

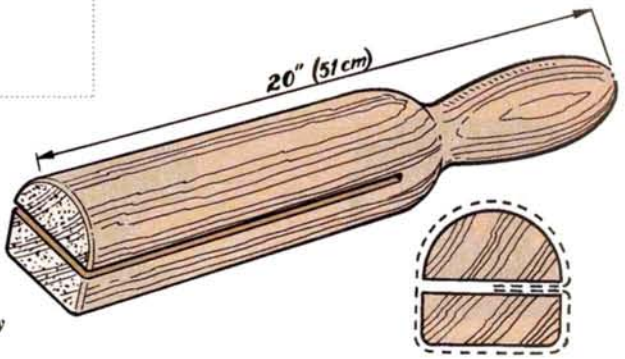
Jim Wilkinson, Panama City, FL



ANTI-MAIM

Wrap a few layers of masking tape around the top of your hobby-knife handle, then pinch the tape to form a "flag." This will prevent the knife from rolling off the workbench.

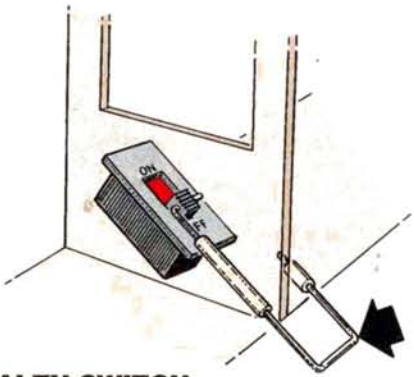
Joe DeMasi, Redwood City, CA



SANDING FILE

Make this tool out of a hard wood, such as beech or maple. Cut a slit in it that's narrow enough to pinch two layers of sandpaper. The dashed line shows the paper wrapped around and then tucked into the slit. Our contributor obtains used sanding belts from a local cabinet shop.

Christoph Leluschko, Greven, Germany



STEALTH SWITCH

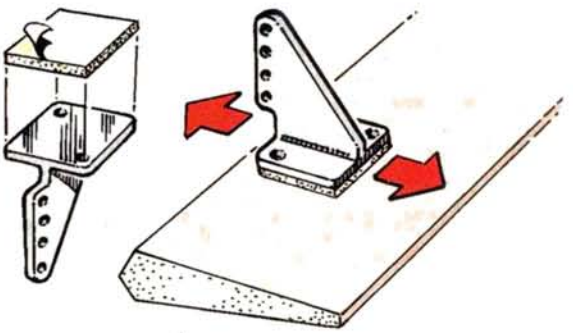
This on/off switch is mounted at an angle in the fuselage and then operated by a pushrod disguised as a foot step. This is ideal for a sport-scale Cub or similar model. The wire runs in a nylon-tube guide. Do not use a metal tube, as there is a danger of radio interference.

Ed Randa, Woodbridge, IL

STICKY SITUATION

If you temporarily mount your control horns with thin servo-mounting tape, you will be able to move them around to check the range of movement, degree of differential, etc. Once satisfied with the placement, drill the screw holes right through the horn and tape, then peel off the tape and screw the horn in place.

Jim Miller, Salt Lake City, UT

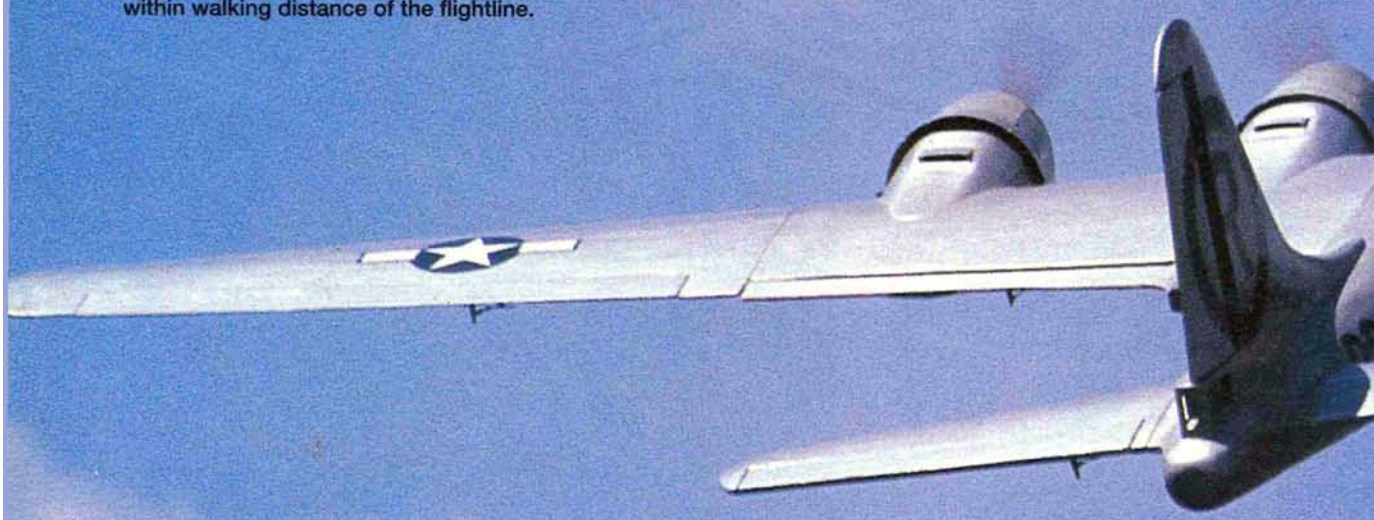


5th Annual Fox Valley Fly In

by DEBRA SHARP

They may call it the "Windy City," but any wind at this year's Chicagoland Festival of Giants came only from the propellers of the nearly 200 giant-scale models there. For this mid-July IMAA District IV mini-fest of fun and fellowship, 160 modelers from as far away as Canada and Georgia came to St. Charles, IL. Big-plane (80-inch-span and up) devotees enjoyed three days of 9 to 5 flying in this small, picturesque town 30 miles west of Chicago.

It's no surprise that participation at Chicagoland, now in its fifth year, keeps increasing. The event host, the Fox Valley Aero Club, has a beautiful flying site with a 50x500-foot runway, a grass strip and ample room for vendor tents, parking, a concession stand, pit areas, a 60x20 charging tent and a section reserved for motor homes and campers—all within walking distance of the flightline.



Chicagoland

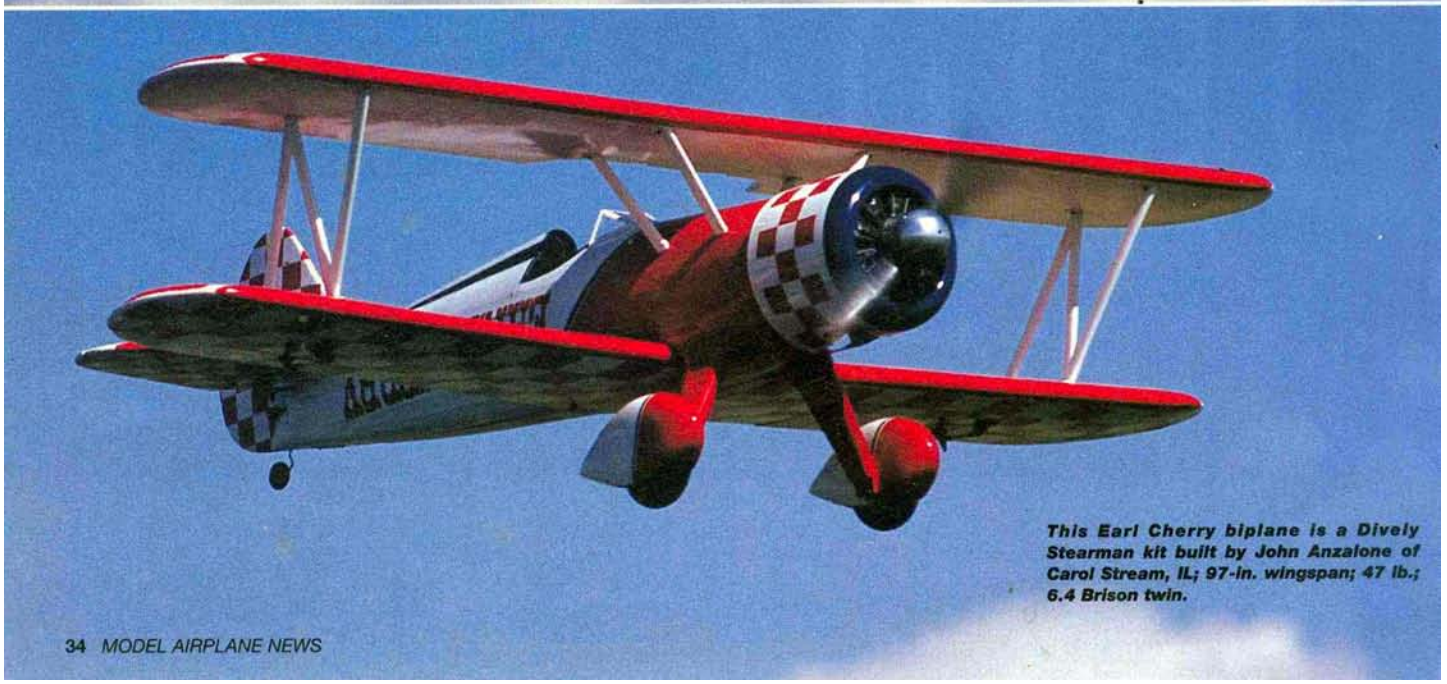
Festival o

Giants

Main image: Mac Hodges' B-29 takes off during the noon show. To the delight of the crowd, when released, the little Bell X-1 mounted under its wing rocketed into the sky. Below (left to right): Bill Brown of Naperville, IL, works on his scratch-built Fokker D-VII; handpainted camouflage; 88 in.; G-62; 29 lb. This great-flying L-19 in trainer colors was built by Ronald Harris of Joliet, IL; 90 in.; O.S. 1.20. Carl Bachhuber of Mayville, WI, sets up his PBY 4AI. Carl built the Liberator from his own plans, and it uses .91 Saito 4-strokes for power. Tom Lazar of Marshall, WI, brought this Ziroli-designed, fiberglass P-38 Lightning built by Bob Kraus; 114-in. span.

This Tuskegee P-51 is the handiwork of Jim Nicosia of Addison, IL, who built it using enlarged Ziroli plans and covered it with glass and automotive paints; 3W 1.20 inline engine; 53 lb.; 116-in span.

A Texan turns on the smoke on a flyby.



This Earl Cherry biplane is a Dively Stearman kit built by John Anzalone of Carol Stream, IL; 97-in. wingspan; 47 lb.; 6.4 Brison twin.

Event co-directors Mike Kostecki and Jack Treadman explained how the Fox Valley Aero Club came to lease such prime real estate for flying R/C. A few years ago, club members convinced the St. Charles Park District to buy land near the Illinois Youth Center (a juvenile correctional facility), so the club would be able to lease the acres needed for a substantial flying field. The cooperation and support of the Park District and the Fox Valley fliers benefit both groups: land that would otherwise have remained unused is well maintained, and the club has a flying field that's so far from housing and business developments that the sound of R/C airplane engines isn't a problem.

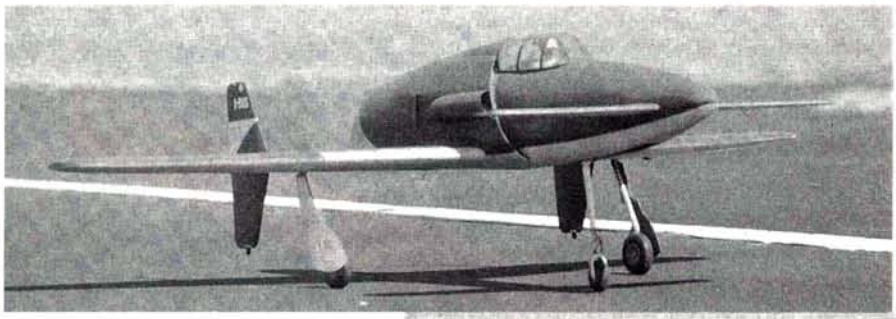
In addition to having a great field for a fun fly, the Fox Valley Aero Club members are obviously experts at running an event of this size, and everything from the transmitter impound to the flightline ran smoothly and efficiently throughout the weekend. Flyers posted in local store windows and articles in all the local newspapers drew a substantial crowd of spectators each day, and Bob Ankney of Ohio R/C entertained and informed the audience over the loudspeaker with a running commentary about the models as they flew by.

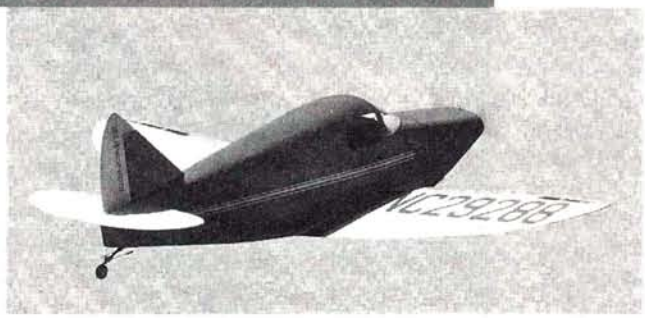
During the noontime shows, Dave Patrick put his big aerobatic CAP through its paces, and Mac Hodges flew his extra-large B-29 with a Bell X-1 under its wing. After the X-1 had been released, Dan Stevens piloted it to a few feet off the ground and then activated its solid propellant rocket to blast off into the sky while the crowd cheered. It's wonderful to watch the general public share the excitement of R/C model airplanes.

The pilots' non-modeling family members enjoyed themselves away from the flightline, too. On Saturday, Sylvia Walker

Frank Buzduhanov's 1930 Fleet bipe smokes through the skies. Frank built it from his own plans; 40 lb.; Sachs 4.2 engine.

Chuck Smith came all the way from Tillsonburg, Ontario, Canada, with his Trillium Corsair dressed in British colors. Chuck notes that the full-size plane saw active service at the Suez Canal in 1953.





Above: perhaps the most unusual model at Chicagoland, this Japanese Shinden was scratch-built by Dan Stevens using enlarged Bob Thacker plans; Super Tigre 3250. Dan told onlookers that the full-size airplane was developed near the end of the War to intercept and shoot down B-29s, but it never went into production. Right: Mark Vazant of Raytown, MO, scratch-built this Culver Cadet. He has had the plane for nearly nine years now and says that he modeled it after a full-size Culver rebuilt by Susan Doosenbury.

of Robart Mfg. organized a sightseeing tour of the area for the pilots' wives, and she and her husband, Bob, hosted a Saturday night barbecue at the Robart facility, which is in St. Charles. As a bonus, modelers were treated to a tour of the building; everyone agreed that the technology and machinery needed to produce R/C gear are impressive. Bob Walker was on hand all weekend to "talk airplane," and he even fixed a retract that had bent on a hard landing.

Robart also donated product for the pilots' raffle, as did Trillium Balsa and Du-Bro. Other R/C airplane manufacturers that had vendor tents at the fun-fly included Model Magic, Dynamic Balsa and Hobby Supply, Cline and Associates, Double-D Productions, TNT Landing Gear Products and Wing Mfg.

Although R/C'ers come to Chicagoland for relaxed, no-pressure flying, most of their models were of contest quality in workmanship and scale detail, with painted glass finishes, rivets, scale cockpits and working lights. Not only were these giants beautifully built and detailed, but they could also have easily represented an airplane "who's who" list, with nearly all aspects of aviation—past and present—represented. Where else besides a modeling meet can you see a WW II Japanese Shinden next to a Culver Cadet on the flightline?

Chicagoland was a "show and tell" of WW I and II warbirds, modern jetliners, classic racers, aerobats and civilian planes. This variety of airplanes added to the weekend's excitement: one minute, two gorgeous B-25s were chasing each other in low passes over the runway; 10 minutes later, an aerobatic bipe with smoke trailing behind it was looping over the nearby cornfield. There was something for everyone at this fun fly.

An event's success depends on its facility, its organizers, participants and, perhaps most important, whether everyone plans to return. Any way you look at it, the Chicagoland Festival of Giants is definitely a winner. Will this editor be back? You bet!

If you'd like to be a part of this event next year, contact Mike Kostecki, 816 Provincetown Dr., Carol Stream, IL 60188, or check the IMAA website at www.fly-imaa.org. Take your giant-scale model to the Windy City and see why "bigger is better."

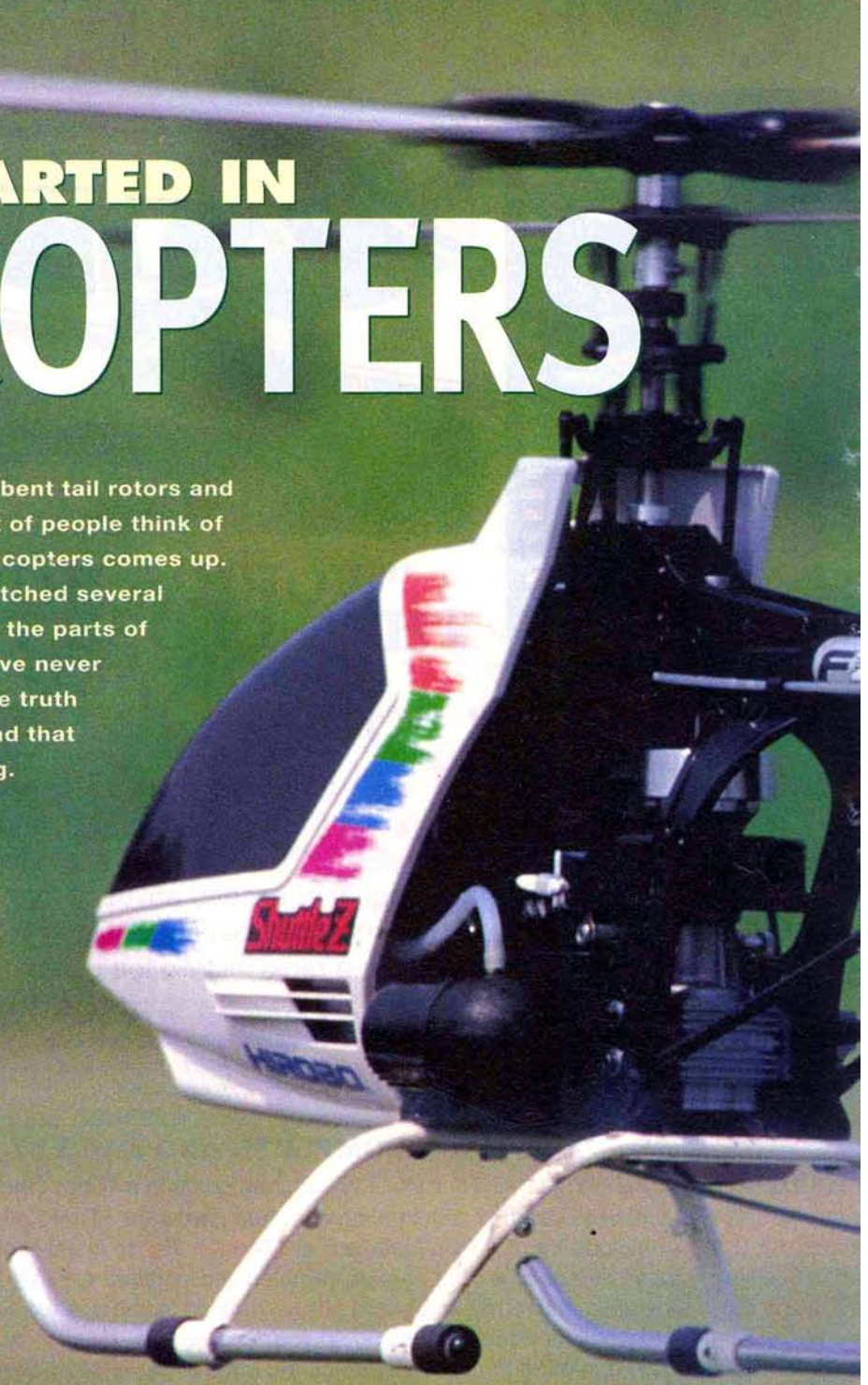
Art Wesolowski of Hanover Park, IL, pilots his Fred Reese Mystery Ship; G-62; 84 in.

One of the many warbirds at Chicagoland, this P-40 prepares for takeoff.

GETTING STARTED IN HELICOPTERS

by LARRY MARSHALL

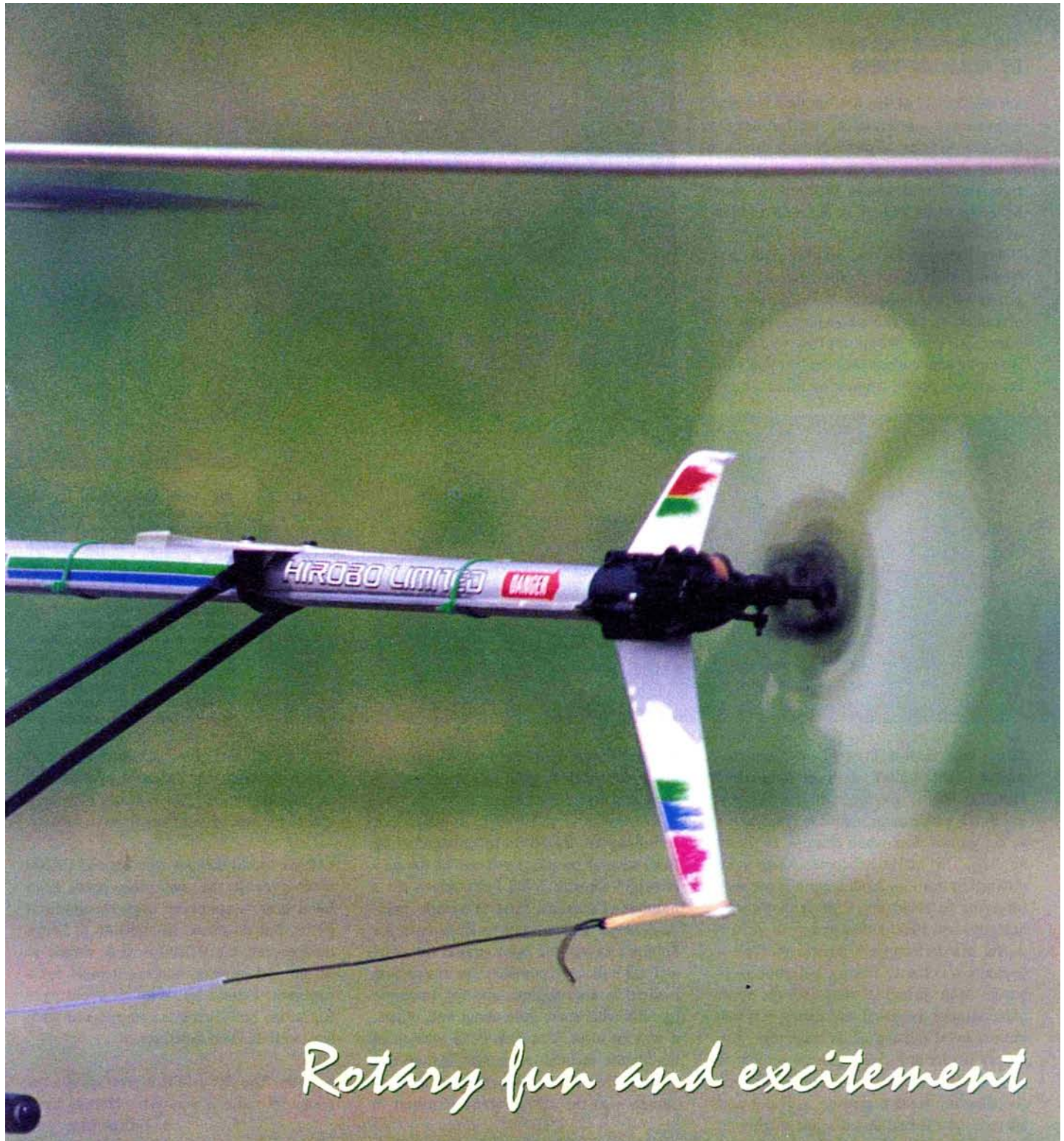
BROKEN BLADES, boom strikes, bent tail rotors and lots of frustration are what a lot of people think of when the topic of learning to fly helicopters comes up. And why? For me, it is because I watched several of my buddies do it, and those were the parts of their "fun" that caught my eye. So I've never tried helicopters before now. But the truth is, it doesn't have to be that way, and that revelation (for me) is why I'm writing.



You see, I found the secret to learning to fly helicopters without breaking a bunch of stuff and spending a lot of money. I have a Bell! That's right, a Bell. Rick Bell is his full name, and he's very knowledgeable about helicopters and has patiently acted as my instructor. I'm far from accomplished, but in a very short time, I've become good enough to remove my training gear and am confident doing basic hovering maneuvers. More important, I've done this without spending a lot of time and money fixing my helicopter. In fact, it was Rick's suggestion that I could learn to fly a helicopter without breaking things that goaded me into trying it in the first place. I'm glad I took the plunge, as helicopter flying is fun and challenging, and it is making me a better pilot, regardless of the type of aircraft I'm flying. It's also neat to be able to fly in the local schoolyard, and helicopters fit small fields very well.

As I've said, I want to share with you the process I went through. I can't say enough to emphasize that this process depends on your having a good instructor. While helicopter guys have been saying that for years, it must be understood that with helicopters, a good instructor is not simply a flight instructor. A helicopter instructor is most important to help you get your machine set up properly and to teach you how to maintain it. With the confidence that comes from watching your instructor fly your machine, you are much better prepared to actually fly it yourself.

PHOTOS BY GERRA SHARP, LARRY MARSHALL AND WALTER SIMS



Rotary fun and excitement

ARE THEY HARDER TO FLY THAN AIRPLANES?

I suppose this question gets asked more often than any other. Depending on who you ask, you generally get the answer "Yes," or "Heck, yes," but this answer doesn't really tell you what you need to know, in my opinion. So, as an experienced airplane pilot and neophyte helicopter pilot, let me elaborate a bit on flying helicopters.

Flying helicopters requires precision flying skills. If you watch Dave Patrick, Chip Hyde, or any of the top pattern flyers, you'll see precision flying skills; these are not unique to flying helicopters. With helicopters you have to fly four functions—all the time. Relating this to airplane flying, constant throttle control to maintain speed regardless of aircraft attitude, coordinating rudder and aileron during turns and maintaining altitude with elevator while making turns is all part of this. This sort of coordination is required to fly some types of aircraft and to do precision aerobatics, but again, most people jam the throttle forward on their airplanes and never touch the left stick until they're ready to reconnect with terra firma.

The visuals of helicopters are very different from airplanes in that they change with only minor changes in orientation. For instance, if you hover 3 feet above the ground, you have the ground to orient to, and you're largely looking down on the rotor disk. Identifying "level" in that context is pretty easy. But move the heli up to 8 feet, and you lose the ground reference, and now you're looking up at the disk. Trying to

decide "level" at this new altitude is a new experience, whereas a similar height increase with an airplane doesn't produce nearly as pronounced an effect on orientation. I've found similar differences when hovering while looking at the right and left of the helicopter.

Helicopters hover; airplanes do not (torque rolls don't count). Hovering is somewhat like balancing a ball on the end of a stick, so the skills I've noted above all come to bear when trying to hover. Hovering also underscores the fact that with helicopters, you're controlling lift in a more direct way than with airplanes, and responses to this control are more immediate. Hovering is also where you must start learning to fly a helicopter, and it is done closer to the ground than when learning to fly an airplane. This makes helicopters seem more difficult to learn, as mother earth is not very forgiving of accidents. I guess that's why heli guys invented training gear.

Top: with helicopters, it's far more important to have an instructor than to have someone teach you to fly. Though Rick is just watching the action here, he was integral to helping me properly set up the helicopter and trim it for flight, and he gave me the confidence that only comes from actually seeing it fly. • Left: here, my Shuttle Z-TS sits proudly on its training gear, waiting for my heavy thumbs to put it through its paces.

So, are helicopters harder to fly?—perhaps too hard? Flying helicopters is harder than throwing your average sport plane around the patch and letting it determine a good portion of its trajectory. No, it's not harder than flying precise aerobatics with an airplane. If you have experience coordinating rudder, throttle, elevator and ailerons, you'll find that it's just a different way of coordinating them, and you'll progress quickly. But helicopters are not "too hard" to fly. I believe anybody can do it if he wants to. Further, I'll go on record as saying that helicopters are a lot of fun, and the challenges of doing even basic hovering competition sequences can provide a lot of enjoyment in a small space.

START WITH GOOD EQUIPMENT

Helicopters and their equipment have improved considerably over the last few years, and the advent of good, inexpensive gyros and computer radios has made building and flying them much easier propositions. Nevertheless, good equipment choices serve as a basis for success.

• **Helicopter**. Based on recommendations from several people, I got one of the new Hirobo* Shuttle Z-TS helicopters for a number of reasons. First, it's fairly inexpensive. It's also easy to find parts for Shuttles, as they've been around for years and are still very popular. The instruction manual is also superb, and for someone like me who knew little about helicopters, it was an asset. The new Z-TS version of the Shuttle includes a top start feature that makes life easy in the pit area; it also comes with the starter wand required to start it. Hirobo also includes the metal clutch housing that has been available as an upgrade option. This is really nice, as it makes for a drive train that is more robust.

• **Gyro**. I used the new Revolution* PZ200 piezo gyro. In the past, piezo gyros have been more expensive than mechanical gyros, but no more. In addition to being inexpensive, the PZ200 is very simple to set up and operate, making it ideal for a beginner. I don't know much about gyro function, but I've been impressed with how well this one functions.

• **Radio**. The JR* 642 is a great entry-level computer radio if you don't already have a radio that can "speak helicopter." Some computer radios can talk both airplane and helicopter, though airplane versions of

The JR 642 offers an inexpensive way to obtain a radio with throttle/pitch curve support—a feature that really makes setting up a helicopter much easier than it used to be.

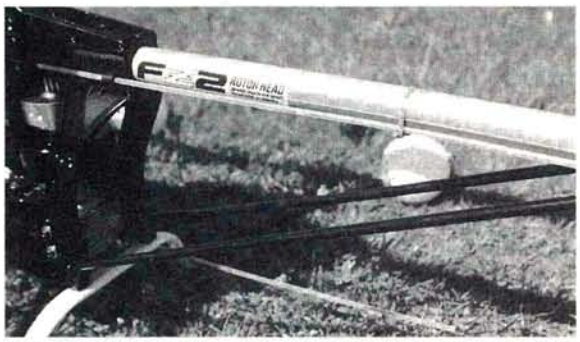
the transmitters put some of the functionality on different switches and knobs than the helicopter version of the same radio. You'll want to be able to program basic throttle and pitch curves with whichever radio you use.

ASSEMBLY IS WHERE IT'S AT

Attention to detail is important when constructing model airplanes, but many an airplane has flown with minor problems in its linkages, trims, balance, etc. Most experienced modelers will tell you that these imperfect models require a lot more flying skill than a model airplane built perfectly straight and with all its controls set up to perfection. So it is with helicopters. Paying close attention to the assembly instructions will reap benefits on the flying field. Go slowly, checking alignment often.

Left: a few good-quality metric wrenches and a ball-link driver make assembly easier. These are available from Horizon* under the "Revolution" brand name. • Top: some helicopter-specific accessories also make life easier, although Hirobo supplies usable solutions with its kit. • Clockwise: a Revolution blade balancer, a set of flybar paddle gauges and a Revolution pushrod duplicator. I like the last tool a lot, as it ensures that your pairs of control links are of identical length.

There are two basic goals when building a helicopter: build it to fly well, and minimize/eliminate vibration caused by moving parts. This means making sure all control rods are *exactly* the right length. In helicopters, many of the pushrods come as pairs. These pairs must be matched with respect to their length. Rotor blades, rotor head, tail rotor, clutch, etc., should be balanced. There are a bunch of ball links that need to be free to move but not sloppy. These are the places where your instructor can help you a lot. Don't rush, and you'll have a helicopter that will give you good service and make you look good while you're flying it. The Shuttle manual is superb, and following the instructions carefully should yield a good flying machine.

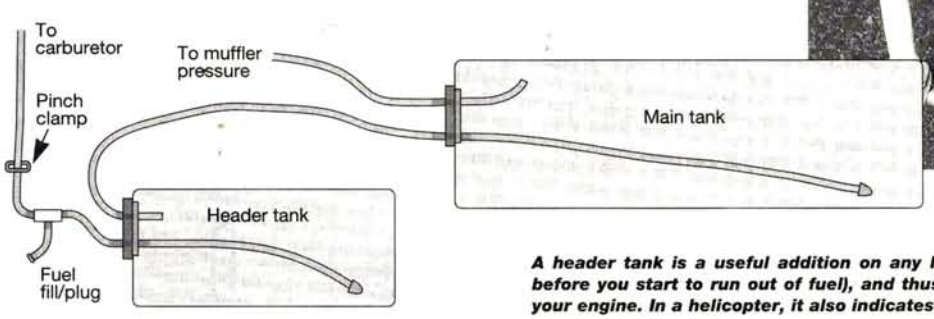


The stabilizer bars cost very little and may be installed with four screws, and they really stiffen up the tail of any helicopter. I picked up my set at the local hobby shop.

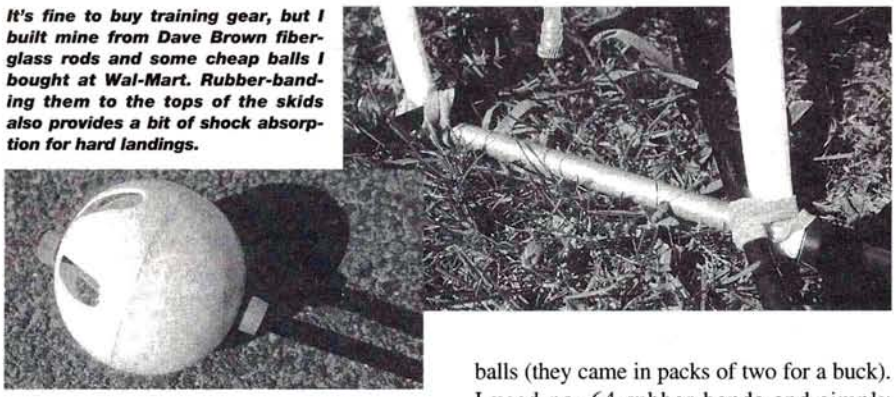
I added several things to my Shuttle to improve it and just because of some personal preferences. I bought a set of tail-boom stabilizer bars; these stiffen the tail assembly. I also added some rubber skid stops to the landing gear. These are very useful if you fly from pavement, as they help prevent the helicopter from pivoting in response to rotor torque while on the ground. These cost but a few bucks, and they're well worth the small amount of time required to install them.

At Rick's suggestion, I added a wheel collar to each side of the flybar assembly. These are invaluable in balancing the flybar once you get your bird in the air. Using them is easy. If you have some vibration in the rotor head, move one of the collars outward toward the paddle. If this improves things, continue to move that one outward until you've minimized the vibration. If moving it makes things worse, move it back to the center, and move the other one out toward its paddle.

Because the head of the Enya* 35CX is hidden when mounted in a Shuttle (unless you look from the bottom of the helicopter), I added a remote Ni-Cd igniter lug to make starting easier. I also added a header tank. This is more of a personal preference, as I like to add these to stabilize the fuel flow a bit more. Now that I have one on my Shuttle, I can't imagine being without it, as the header tank lets me see when I'm getting low on fuel. This amounts to little more than adding a 2-ounce tank, a bit of fuel tubing (see drawing) and some sort of "T" fitting that will allow you to fuel the system. I used a KSJ* fuel filter as my "T," and it does double duty. Fueling my system does require that I pinch the fuel line to the engine while I fuel (I use a KSJ clamp for this), but the system works flawlessly, and I don't have to worry about fuel foaming.



A header tank is a useful addition on any R/C aircraft. It always remains full (until just before you start to run out of fuel), and thus eliminates any air bubbles that might reach your engine. In a helicopter, it also indicates that you still have a couple of ounces of fuel.



It's fine to buy training gear, but I built mine from Dave Brown fiberglass rods and some cheap balls I bought at Wal-Mart. Rubber-banding them to the tops of the skids also provides a bit of shock absorption for hard landings.

FLYING

Once your helicopter is assembled and you've run the engine enough to be confident in its function, have your instructor fly it. He will be able to help you with several things. First, he will identify any problems with the helicopter's construction. He will also trim it properly so that it will hover with minimal inputs. Third, and this is the most important thing, if you see it fly and fly well, you'll know that it's possible, and that's important when you try something new.

During your early steps into helicopter flying, you'll need training gear. There are many quick-to-assemble kits, but you can also make them pretty easily. If you're learning with a .30-size helicopter, you might want to follow my lead. I bought a package of Dave Brown* fiberglass pushrods. I went to Wal-Mart and bought four small Wiffle balls (they came in packs of two for a buck). I used no. 64 rubber bands and simply wrapped a band around the rod, dribbling CA onto it. Using this method, I produced flexible stops on each side of the ball. My training gear were held to the skids with rubber bands, and it worked great.

The first thing you will be doing is sliding the heli around on the ground, trying to maintain a stable condition with the balls on the training gear either touching or nearly touching the ground. With training gear, it's pretty tough to break anything. Once you feel comfortable with this, bring the helicopter into a hover about a foot off the ground. Keep the tail toward you but with the heli off just a bit to your right or left (whichever is most comfortable) during all of your initial hovering, as this orientation gives you the best chance of providing the proper inputs. The only way to learn basic hovering is to burn fuel doing it; in fact, this is one of the ironies of helicopter instruction. Your instructor can help guide you by watching your progress and directing you, but he can't help you fly, and he can't take control if there's a problem, as there's just no time. So, go slowly; assess your comfort level at each step along the way. Discuss this with your instructor; it will help him make suggestions.

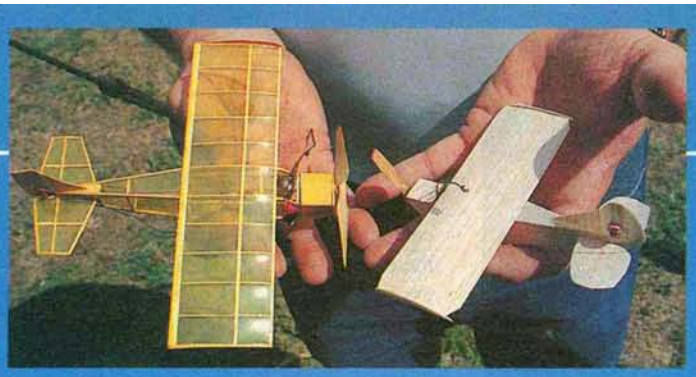
Once you can maintain a stable hover, you'll want to start moving the helicopter from side to side, stopping to your right and left, each time bringing the helicopter into a stable hover. Once you feel comfortable with this sort of thing and you can take off and land straight up and straight down, it's time to cast off the training gear. It will only hold you back. With the gear off, slowly work yourself back to doing these simple hovering maneuvers without the training gear.

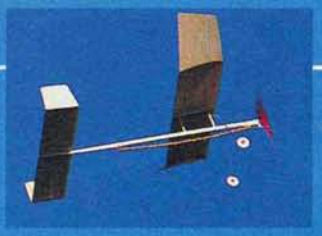
Rick is the secret to my success and my enjoyment of learning to fly a heli. Here, however, he's telling me to stop chasing the cat.

Ah ... there's just nothing like it. The heli is more responsive with the training gear off, and you can begin doing hovering maneuvers. What fun!

One of the things that intrigues me about helicopters is the variety of maneuvers you can do in a small area while essentially hovering. Horizontal and vertical figure-8s done as squares or as circles are quite challenging. Precisely hovering over points on the field and sliding the helicopter between points is a lot of fun. Any of the maneuvers can be done by sliding from place to place or pointing the nose in the direction of travel. The variety is nearly endless, and you can do a veritable precision pattern routine in the confines of a baseball diamond. Give helicopters a try; I know you'll enjoy it.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*





by LARRY MARSHALL

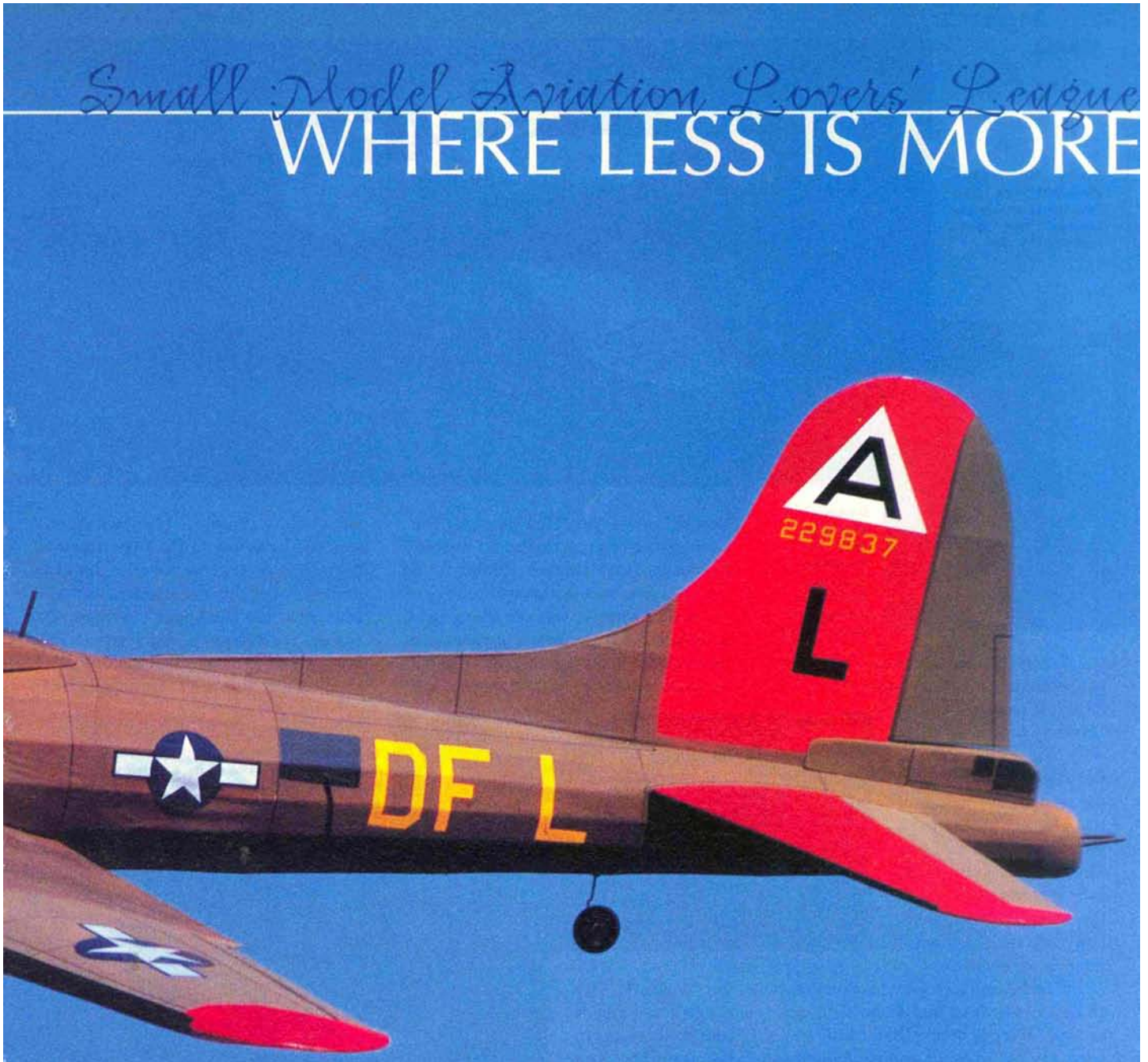
IT WAS MY FIRST time at the annual Small Model Aviation Lovers' League (SMALL) event that occurs outside of Little Rock, AR, every year, and I was pretty excited about meeting a new group of kindred spirits who like flying model aircraft—particularly small model aircraft. This organization, founded a bunch of years ago by Randy Randolph and Joe Wagner to promote the flying of small model airplanes, has but one rule; legal model aircraft must be powered by a .25 or smaller engine. They do seem to squint when administering this rule, however, and one of the more popular small engines is the O.S.* .26 4-stroke.

S.M.A.L.L.

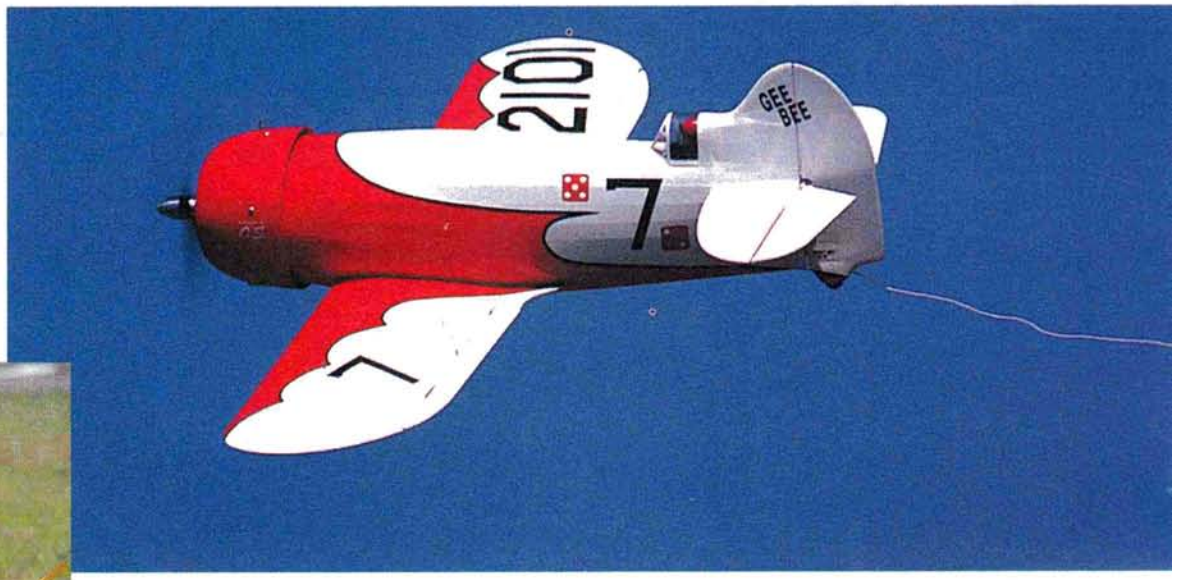
Main image: Pat Tritle's Speed 400-powered B-17 put in some very realistic flights. It uses 8-2000mAh cells as a fuel tank. Top left: Henry Pasquet builds 'em small. Here are two of his CO_2-powered R/C planes. Top center: here is an example of the rubber-powered planes that flew over the SMALL flying field. Top right: Ernie Harwood's Blackburn Monoplane flew very well, and it looks great. Near right: Keith Tucker flew the heck out of his diesel-powered Handful. Far right: Joe Malinchak's Herr Pitts Special was a real gem.

Small Model Aviation Lovers' League

WHERE LESS IS MORE



PHOTOS BY LARRY MARSHALL



Right: this Hobby Hangar Gee Bee flew great and really looked the part while in the air.*

Danny Wampler flew this Randolph-designed BeeTween throughout the weekend.

I was in for some surprises at this event, as I had heard these guys were pretty laid back and non-competitive. Having spent a weekend with them, however, I know that this is not true; the competitive nature of SMALL members is as intense as any I've seen. Though there didn't seem to be any trophies given to the winners, there were, I'm convinced, several prizes being sought.

For instance, there were many entrants in some event that had to do with generosity. Everywhere you looked, guys were giving up their own stick time to help someone else into the air. If you didn't have a plane, no problem; they'd let you fly theirs. But if they had let me vote in the generosity contest, the award would have gone to Keith Tucker, who kept me (and others) supplied with Diet Coke and Butterfingers. Another competition—and this one must have been the "biggie"—was the "Had the most fun" award as the guys scrambled all weekend to "out-fun" one another. I think, in the end, everyone won that award.

Another surprise was the flying field; it's smack-dab in the middle of the town of Maumelle, a beautiful, "family-oriented" (according to the press) community. And the Maumelle City Council and mayor really live up to this moniker. Ron Stanfield, CD for the event, told me that the city gave the Maumelle Sky Tigers use of the land and the right to build a model airport there. When they saw the club members working to level an area for a runway, the city sent out a bulldozer to help them. That would be surprising enough, but Ron pointed to the spectator stands that had been set up for the event and said, "The city brought that out for us, set it up, and they'll be back to pick it up when we're through. They set up this tent, too [referring to the huge impound/registration tent we were standing under]." During the event, the local newspaper ran front-page coverage of it and earlier had run a major article promoting the Sky Tigers and the upcoming event. Now, that's a "family-oriented" community if I've ever seen one; my hat is off to Maumelle.

Left: here's a Farman 400 from Pat's Custom Model plans. In spite of its 54-inch wingspan, it flew great with a geared Speed 400 and a 9x5 prop. Below: Dan Walton's Spruce Goose speaks for itself. The eight .010 engines ran flawlessly.

This Lite Machines LMH100 flew great; it was the sole helicopter at the event.

SMALL is also run a bit differently; more like events were run 20 years ago. They flew free flight, control-line as well as R/C during the event. It really brought back memories of a different time when, if it flew, it was good and with many folks doing it all. And these planes were powered by rubber, CO_2, electric, diesel and glow powerplants. While SMALL's .25-size limit on engine eliminates most commercially available helicopters, even

This biplane really stirred up the sky.

they were represented by Dan Walton's Lite Machines* LMH100, and he flew up a storm with it.

And speaking of Dan Walton, he's really a master with little engines. He flew a big Spruce Goose, powered by eight Cox* .010 engines. Not only did it fly well; it was amazing to watch Dan start all those engines with nary a hiccup from any of them.

Ed Stephens of Norvel* was there with his buddy Bob Abete. Because of the popularity of the Norvel engines, Ed and Bob were busy giving advice and selling engines. With all the Norvels on the field during the weekend, they might vie for the prize of the engine type that burned the most fuel over the weekend. Ed and Bob helped in that regard by flying their two new airplanes, a .061-powered Tutor and House of Balsa's* Texan, powered by its new .15-size engine.

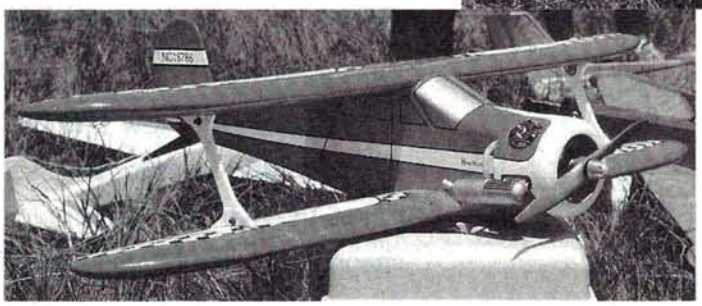
You can't have an event for small airplanes without a Lazy Bee contingent. This Clancy Aviation* design is one of the most popular designs of the decade, and it and its spinoffs, the Speedy Bee and the Handful, were in force at this event. I had never flown a Handful before, but Keith Tucker let me fly his, which he powers with a PAW .03 diesel. It was so much fun, I hunted down Eric Clutton (Dr. Diesel) and bought myself a PAW .03. I was actually surprised at how easy it was to fly, given its agile nature.

CO_2 is a power source you don't hear about all the time; it's mostly associated with the flying of free-flight airplanes. But a bunch of folks were there flying R/C using CO_2 motors. I would have said "guys," but one of those "folks" was Cindy Malinchak, who was flying the first R/C plane she has ever built: a Peck Polymers* Cougar. For those who are unfamiliar with this kit, it's a peanut-scale model with a wingspan of 13 inches. Her husband, Joe, is a diehard CO_2 guy, but I'm afraid he lost the "level of excitement about the hobby" contest to Cindy ... sorry, Joe.

Joe's planes are pretty neat, though. One that really caught my eye was his Herr Engineering* Pitts Special. Yep; the free flight kit, with a wingspan of 24 inches. Joe converted it to a full-house R/C plane and powered it with the new GM500 CO_2 motor that sports throttle control. He's flying the plane with a Cannon* receiver and WES-Technik servos.

As long as we're talking CO_2, I have to mention Henry Pasquet, the king of small airplanes. Henry has taken the concept of "small R/C" to the point at which most models we mere mortals call "small" are very large by comparison. When you can start resting R/C planes in the palm of your hand, that's small.

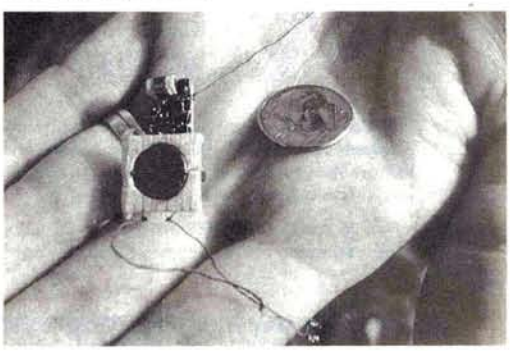
Right: this is the new Tutor from Norvel. Below: Brent Pyland flew this Ace Beech Staggerwing with an O.S. .15.

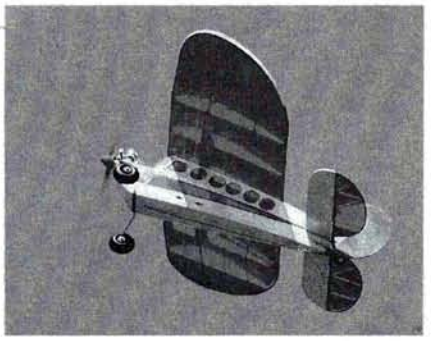


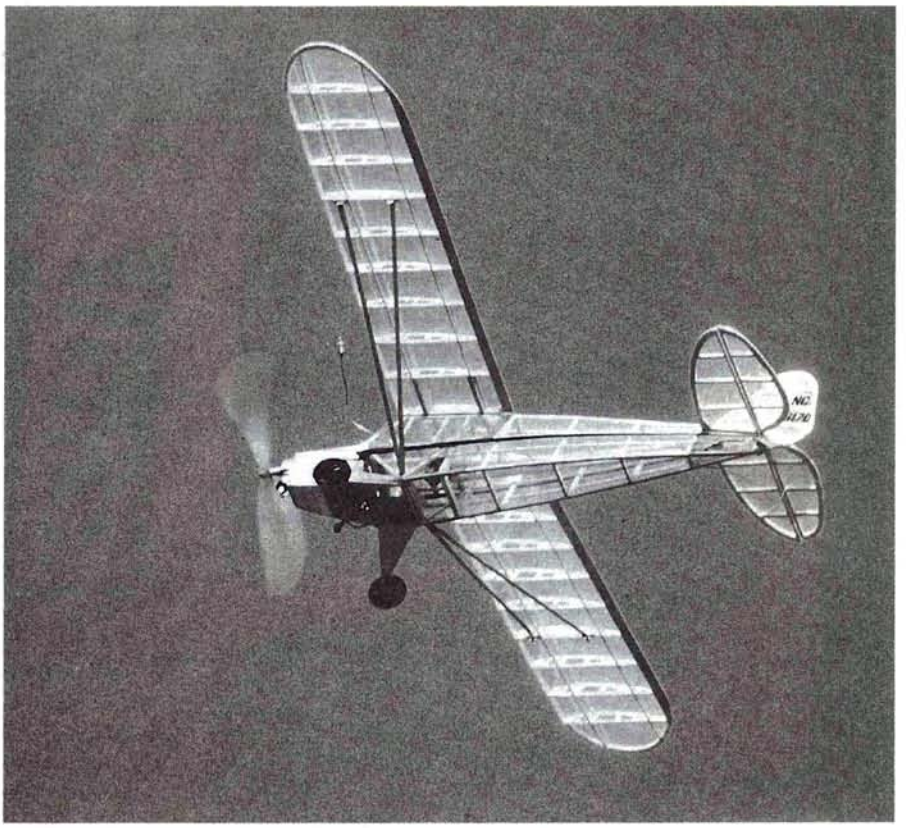
The Speed 400 phenomenon was in evidence as well. These little birds are popping up everywhere. Ryan Aircraft* Hellcats and Pat's Custom Models* Farmans and Eastbourne Monoplanes put in a lot of flights, and Pat's B-17 was simply awesome. My understanding is that Pat is doing a construction article for *Flying Models* on this one. Stay tuned for a Pat Tritle construction article in *Model Airplane News*, too. I can't tell you what it will be, but the plane is as cute as a bug and flies great.

There were larger SMALL electrics as

Joe and Cindy Malinchak had a gaggle of small, CO_2-powered R/C planes, including this P-47 and Nesmith Cougar. The secret to flying these tiny R/C planes is the really tiny receiver.







Above: Lazy Bees were everywhere, and they're still fun to watch. Right: while transparent covering isn't scale, it sure is pretty when overhead.

well. Gary Kyle flew a Model Tech* P-51 and a Laird Spitfire, both converted from slope-soaring models. These were impressive as Gary put them through their paces. Don Johnson was flying his Ace* Tiger Kitten on 9 cells, with a geared Astro 05G.

The man himself—Randy Randolph—was there, spreading his Southern-gentleman charm. Randy has been one of my heroes for a long time, and it was pretty special for me to get to fly one of his planes: a Jr. Falcon. Examples of Randy's designs were very much in evidence as people flew BeeTweens, Dimes and others throughout the weekend. One of the most

prolific writers/designers of our time, Randy's humility and generosity could serve us all as a model for life. In fact, if you'd like to get a taste of SMALL activities, you might want to head to Dallas for Randy's Small Steps meet, October 10 and 11. Contact Danny Ball at (972) 286-4278.

Oh ... one last competition that existed at SMALL this year: who spent the most time laughing and smiling. I think I was in the running for this one, mostly due to all the help given by the participants of the event. But I have to credit Emmett Fry most of all for my "success" in this event. You see, Emmett creates the most wonderful awards: each consists of a marble base on which is mounted an engraved plate and a tree. In the tree is a small airplane. The SMALL organizers decided to make me a "SMALL STEPPER" and gave me one of these awards. It now rests atop the computer on which I'm writing this article, and it's one of my prize possessions. While SMALL is an international organization, the SMALL event in Little Rock is steeped in Southern hospitality. Put it on your calendar for next year.

Above: Gary Kyle's Model Tech P-51 flew very well as an electric-powered plane. Left: Emmett Fry made these really cute awards for SMALL '98. Below: Larry Hacker brought an air force with him, including this Flair monoplane powered by an O.S. .26 4-stroke.

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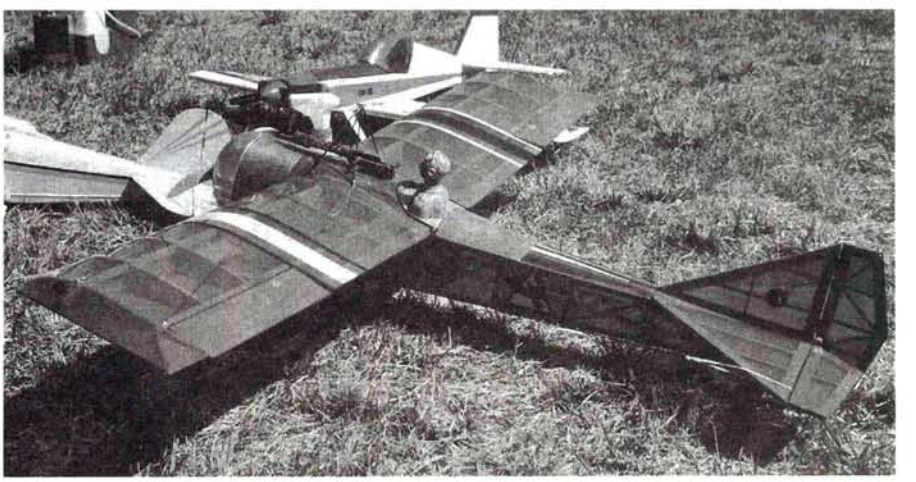


MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Versatile Speed 400 sport plane

MODELS POWERED by inexpensive Speed 400 electric motors have become very popular in the last couple of years, and for good reason. The initial investment of time and money is relatively low, and these types of models can be built quickly and they fly well. And they're a little like potato chips in that you can't seem to quit after just one. I know; I've built five or six scale and pylon Speed 400 planes in the last two years. I've always wanted a sport plane in that size, so I jumped at the opportunity to review the Bill Griggs Models* Assault.

BILL GRIGGS MODELS

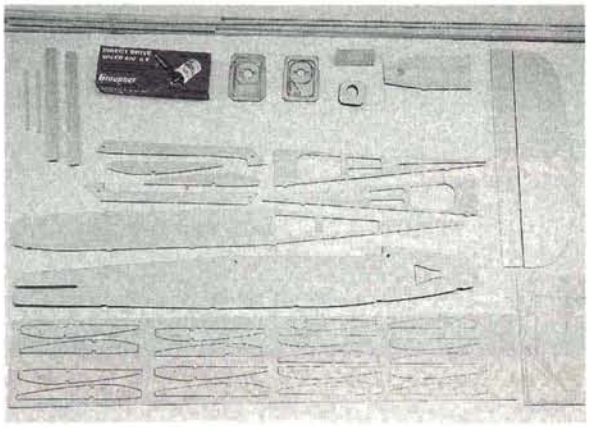
Assault

by JOHN KAUK

A quick check of the kit's contents revealed good-looking, laser-cut balsa and plywood parts, full-size, CAD-drawn plans and two motor-mount plates—one each for Speed 400 and Speed 480 motors. The ribs were of firm balsa, and the other balsa parts were light, but not too soft. I also received a sample Bill Griggs 6V motor and an optional power kit with a 6V Graupner motor, spinner and CAM 5x5 prop.

On my plans, there was an 1/8-inch difference between the lengths of the fuselage sides and the top; this temporarily confused me but wasn't a major problem.

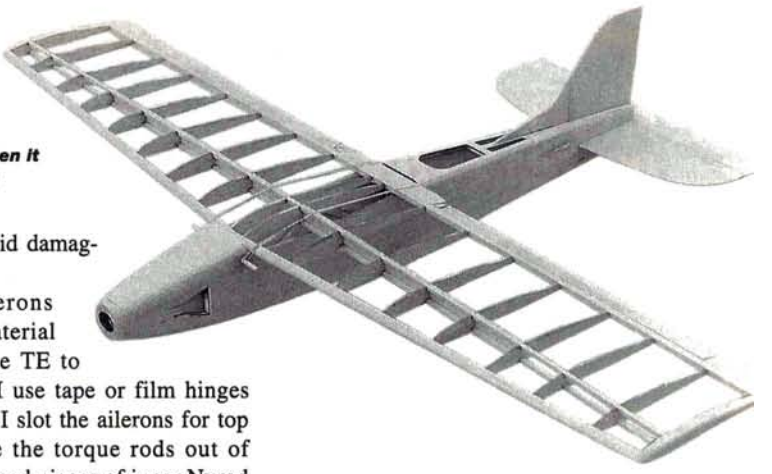
The instructions consist of six typed sheets without pictures or drawings. There were several typographical errors and some inconsistencies between the instructions and the plans. These are being addressed by the manufacturer and shouldn't be a problem in future kits. The Assault isn't for a beginner, but an average modeler with a few built-up planes to his credit should be able to build and fly it successfully.



The low parts count allows a short building time.

WING CONSTRUCTION

The wing is built in one piece, without dihedral, using traditional built-up construction. After pinning the 1/8-inch-square spruce spar and balsa trailing-edge (TE) stock to the building board, I used a Hitec* HS-80 servo to adjust the spacing of the two center ribs. After that, construction was pretty straightforward, using the spar shear webs to space the ribs accurately. There is nothing unusual about the building sequence, but the wing is pretty flexible until it has been covered, so take extra care while sanding it to avoid damaging the structure.



The airframe is ready to cover. The wing structure stiffens up appreciably when it has been covered.

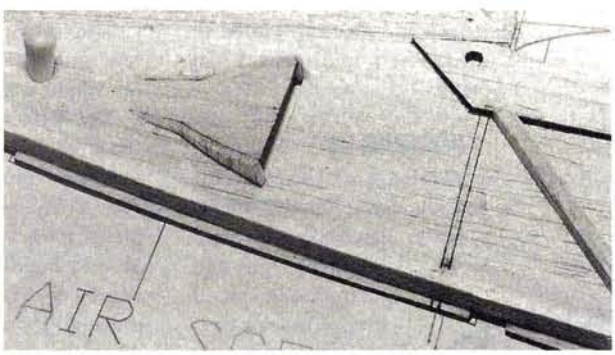
I cut the ailerons from the TE material after sanding the TE to shape. Because I use tape or film hinges on small planes, I slot the ailerons for top hinging. I made the torque rods out of music wire and used pieces of inner Nyrod tube for bearings. The instructions recommend the use of flattened brass tube over the torque rods to connect them with the servo linkages; instead, I used ball links soldered to the torque rods for a tight, slop-free connection.

FUSELAGE CONSTRUCTION

The fuselage is a simple sheet-balsa box with rounded corners, and it tapers to blend with the spinner at the nose. Construction begins with marking the former, doubler and longeron positions on the side pieces so the parts can be accurately assembled. To do this more easily, I extended the former lines on the plans using a pen and a straightedge. Then I glued the doublers, longerons and triangle stock into place. I used Pica* Gluit for these parts, as they will be sanded to form the rounded fuselage corners. The top triangle ends at former 2; the bottom piece should extend to the front of former 3. I had to trim the wing-saddle doubler 1/4 inch at the front and 1/8 inch at the rear so the top triangle stock and square longerons would fit.

The instructions tell you to build the cooling air inlet next; this is simply a matter of blocking the inlet open and gluing vertical-grain balsa to hold it in place. When I built the first inlet, I found that the triangle stock got in the way when I trimmed the vertical-grain balsa. On the second fuselage side, I finished the air inlet before positioning the doublers and triangle stock; this was much easier.

When gluing formers F2 and F3 into



The cooling-air-inlet construction and positions of the doublers. Notice the extended former lines on the plans.

PHOTOS BY JOHN KAUK

SPECIFICATIONS

Model : Assault

Type: Speed 400 sport

Manufacturer: Bill Griggs Models

Wing area: 201 sq. in.

Wingspan: 32.5 in.

Length: 24.5 in.

Weight: 16.6 oz.

Wing loading: 11.8 oz./sq. ft.

Power rec'd: Speed 400 6V or 480 Race motor on 7 or 8 cells

Power used: Graupner* 6V Speed 400, 8 Sanyo* KR600AE cells, Graupner CAM 5x5 prop

Radio req'd: 3-channel (aileron, elevator, throttle)

Radio used: Futaba* 8UAF, FMA Direct* Micro 2000 receiver, Hitec HS-80 servos

List price: $65 (kit and G400 motor).

Features: laser-cut parts; full-size, CAD-drawn plans.

Comments: the Assault is an attractive sport plane that's capable of fast, aerobatic flight and a slower, more sedate performance.

Hits

- Quality of wood.
- Good flight characteristics.
- Simple, fast construction.

Misses

- Some parts didn't fit together well.
- Sketchy instructions and inconsistencies between plans and instructions.

FLIGHT PERFORMANCE

In addition to the usual flight check, before I fly a new plane, I always plug the numbers into ElectriCalc. In this case, I wasn't too worried; with a wing loading of around 12 ounces per square foot and a power loading of 93 watts per pound, I was sure of sparkling performance, which the ElectriCalc program confirmed. Nevertheless, I always have someone else launch a new model until it has been trimmed and I'm comfortable with it.*

• Takeoff and landing

Preflight checks behind us, my friend Greg Gimlick gave the Assault a firm toss toward the horizon. It climbed out aggressively on the CAM 5x5 prop and quickly got up to speed. The first flight was a bit exciting due to an elevator that was too sensitive. Subsequent flights with less control throw and a slightly more forward CG proved to be much more enjoyable. Field adjustments resulted in the CG being set at 2.5 inches from the LE; the elevator throws were about 3/16 inch and the ailerons about 1/4 inch. On the third flight, I launched the Assault by myself: advance the throttle and give the plane a firm push, and off it goes.

Landings are easy if you remember how slick the plane is and you cut power early enough to allow it to slow down. It maintains good control authority at landing speed and settles right in after the speed has bled off.

• Low-speed performance

At low speed, the Assault maintained good control authority right to the stall. As the speed dropped off, I fed in more up-elevator until it looked as if the plane had stopped in the sky. When it did stall, it just dropped its nose and resumed flying. Aileron response got a little mushy at really low speed, but it remained effective. Different throttle settings will require some readjustment of the elevator trim, but I expect that with a flat-bottom airfoil.

• High-speed performance

The Assault is pretty quick at full throttle, but it's no pylon racer. At 4 minutes or so, full-throttle flights would be a bit too short for my tastes, and throttling back extends the duration appreciably. The model flies quite well at about 60-percent throttle. Rolls are crisp, and it will fly loops of a nice size. Good throttle management will result in flights of 6 to 7 minutes. I couldn't induce a high-speed stall. When I tried, the Assault just did tight little loops, over and over. Controls are solid at speed, and the plane flies very smoothly—more like a plane twice its size.

• Aerobatics

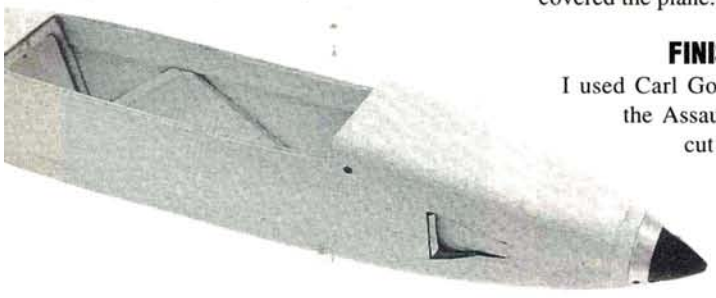
The Assault will do every aileron/elevator maneuver in the book. Loops can be big and round or little, tight things. The roll at high speed is axial and fairly quick, and the Assault is capable of doing nice slow rolls with a smooth elevator stick. Inverted flight requires a little down-elevator, and the control responses are about the same as when upright.

place, I found that F2 didn't fit. I had to lengthen the slot by 1/8 inch in the upper side where it fit over the doubler. After gluing the fuselage sides together and making sure they were square, I secured the tail pieces with the fuselage pinned over the plan to check alignment. At this point, the instructions call for the installation of 1/8-inch-square cross-braces, but their locations aren't specified, and they aren't shown on the plans. I put them between the rounded cutouts on F5 and F6, taking care to fit them accurately, and this has worked well. The cross-braces stiffen the tail, so they shouldn't be omitted.

To make sure I got a smooth bend in the nose between Fl and F2, I made three razor-saw cuts in the top and bottom triangles. After getting the fuselage bottom into place, I installed the motor mount for a Speed 400 motor. I also added a strip of 1/64-inch ply along the bottom of the fuselage between F2 and F3 to stiffen it enough to support the battery. While the top of the fuselage was open, I installed the elevator-pushrod guide tube and braced it to minimize flexing. Then I installed the top decking, which required a bit of trimming to fit well. The installation of the balsa nose block finished the construction; I mounted the motor and spinner and sanded the fuselage to shape.

The vertical and horizontal stabilizers are 3/32-inch sheet. The instructions mention that you can cut lightening holes in them. I chose not to do this, as the weight saved would be negligible and I didn't want to weaken the parts. I beveled the elevator for top hinging and rounded all of the leading edges and sides. I waited to install the tail feathers until after I had covered the plane.

Sand and shape the nose so that it will fair smoothly into the spinner. Judicious sanding lightens the structure and makes the fuselage more aerodynamically sleek.



FINISHING UP

I used Carl Goldberg's* Ultracote for the Assault. Some vinyl graphics cut to match the distinctive lettering on the instructions spiced it up a little. I covered the elevator and horizontal stab at the same time, making a film hinge in the process. I messed up the film hinges for the ailerons, so I cut them free and used clear packing tape, which works just as well. As expected, the covering added quite a bit of rigidity to the wing structure.

Installing a radio in these small planes can be quite a chore because of the limited room available, so I was quite pleased to find more than enough space in the Assault. It's practically roomy compared with some of the other planes I've built. I tucked the receiver into the fuselage behind the wing and secured it with Velcro®-brand fastener. I wrapped the elevator servo in clear packing tape and glued it into position just in front of F3, leaving lots of room in front of it for the battery. To keep it out of harm's way, I secured the speed control—a Castle Creations* Sprite 20—high on one fuselage side with Velcro®. The Assault's all-up weight was 16.6 ounces.

The Assault kit can be built quickly (it took me five, three- or four-hour evenings) into a good-looking model. It flies nicely, and any modelers with a couple of planes under their belts should be able to handle it. Although the Assault can be fast and aerobatic, it also slows down nicely into a fairly docile flyer.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.* ✦

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

SEMI-SCALE WARBIRD ARF

"Almost" is rather nebulous in the term, "almost ready to fly." As far as model airplane kits are concerned, it can mean anything from instructions to "fill fuel tank" to "begin by locating part A on the printed sheet"! Most ARF kits fall somewhere between those parameters, but all require a certain amount of skill to be finished properly. I am convinced that ARFs are a very important addition to the hobby. Those who complete and fly them should be proud of their work!

MODEL TECH Me109

by RANDY RANDOLPH

The Model Tech* Me 109 kit falls in the upper third of the above-described limits. It's a very nice, semi-scale airplane with most of the time-consuming work already finished, and it flies like a small pattern ship and looks good in the air. You can easily assemble it during a windy weekend.

FIRST IMPRESSIONS

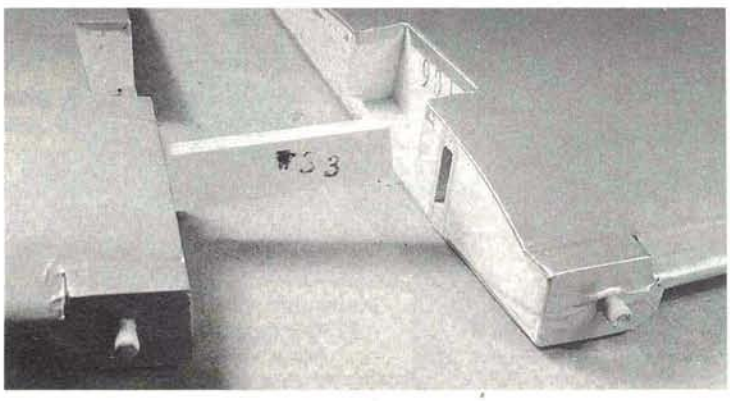
This is a well-packaged kit. Anything that could possibly be damaged during shipping is wrapped separately in a clear plastic bag. In addition, the parts are separated by cardboard. The construction manual is well done, although the photography—while adequate—is not quite as crisp and clear as it could be.

Along with completely covered flying surfaces and fuselage, the hardware package includes a fuel tank, engine mount, landing gear and wheels as well as all linkages. There are a few things needed to build the airplane, but the accent is on "few." Other than glue and a modeling knife, a few drills and screwdrivers, some sandpaper and a ruler, you'll need a 4-channel radio and the recommended .25-size engine.

CONSTRUCTION

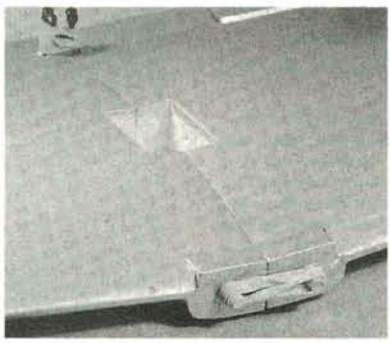
I like the term "construct" because it seems to fit the bill better than "assemble"! Regardless of how an airplane is built, its parts must be assembled; in this case, the parts are just a little bigger and fewer in number.

Because of differences in temperature and humidity between the factory and your workshop, wrinkles may form in the covering material. This is especially true where air can be trapped over the solid wooden parts of the airplane. These wrinkles are easily removed with a trim iron or a small travel iron set on medium heat. It is much easier to remove wrinkles before starting construction. I followed the manual, step by step, and found the assembly sequence to be well thought out and logical.



After trimming away any covering overlap on the center of the wing panels, they are joined with a plywood wing joiner. Everything fit perfectly and joined together smoothly.

The first step is joining the wing halves. You must trim away all covering in the areas to be glued. This is not outlined in the manual but is more or less a common practice. The plywood wing joiner was a perfect fit, and the wing halves went together smoothly and easily. I used rubber bands around the two dowels at the leading edge and the aileron horns at the trailing edge to maintain pressure while the epoxy set.



While the epoxy was curing, I used rubber bands around the dowels in the leading edge and the aileron torque rods at the trailing edge to keep pressure on the joint.

After a little trimming and shimming to mount the wing bolt doubler, installing the ailerons and servo mount took very little time.

Mounting the tail surfaces was a piece of cake. The only difficulty was bending the stabilizer braces a bit to correspond with the fuselage sides for a good fit. Installing the elevators was very easy and smooth, but the rudder and its attendant tailwheel were not quite as straightforward! First, the tailwheel mount was different from the one shown in the instruction manual (actually, it was better!). However, because it was already bent to shape (slightly off-center), I had to drill a hole in the rudder to match the mount—no problem. The manual states that you should screw the bracket to the bottom of the fuselage and then epoxy the rudder to the hinges and tailwheel tiller at the same time! It was far easier to epoxy the tailwheel tiller to the rudder, then mount the rudder and finally mount the bracket to the bottom of the fuselage. Done that way, the rudder fit properly, as did the bracket to the fuselage.

When the tailwheel mount was in place, the hole in the wheel was too large for the axle, and only one wheel collar was available where two were necessary to center the wheel. I shimmed the tailwheel with a brass tube to match the axle and soldered washers on either side to center the wheel and hold it on the axle. The completed tailwheel assembly then ran smoothly and was true to the rudder.

The landing-gear legs are of the torque type and slipped easily into place, but the wheels, which are very nice, are centered on their axles with a wheel collar on each side. However, the wheels have recessed hubs, so the outboard wheel collar must be up inside the wheel with no satisfactory way to tighten the Phillips-head setscrew! The way the wheels are splayed out on

PHOTOS BY RANDY RANDOLPH & LARRY MARSHALL

SPECIFICATIONS

Model name: Model Tech Me 109

Wingspan: 45 in.

Wing area: 360 sq. in.

Wing loading: 20 oz./sq. ft.

Length: 37 in.

Engine req'd: .25 to .36 2-stroke

Weight: 3.2 lb.

Radio req'd: 4-channel with four servos

Price: $99.99

Features: the Model Tech Me 109 is an ARF kit that includes a completely finished, all-wood airframe covered with Ultracote. A prepainted fiberglass cowl is also included along with a decal sheet and a detailed clear canopy. The hardware package is complete and includes engine mount and wheels.

Comments: there are only a few glue joints necessary to complete the airframe: the wing halves, the fin to the stab and the stab to the fuselage. The finished airplane looks good in the air and is a solid and stable flying machine.

Hits

- Good instruction manual.
- Well-built and covered model.
- Complete hardware package.
- Nice flyer!

Misses

- Supplied tailwheel mount not the one shown in the manual.
- Difficult—if not impossible—to install provided fuel tank as per instructions.
- Main-gear wheel collars very difficult to secure in recessed wheel.

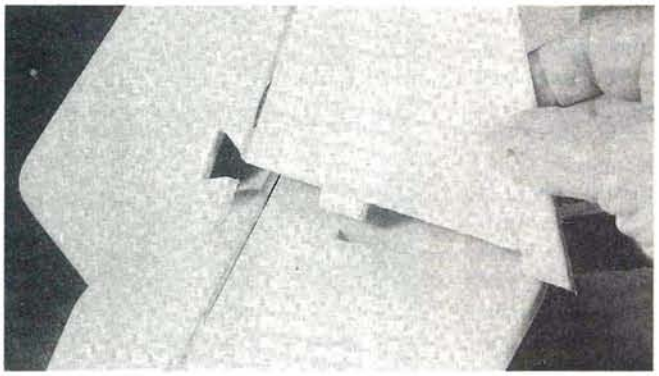
outboard wheel collar, so to be sure it was secure, I soldered the outboard wheel collars to the axles.

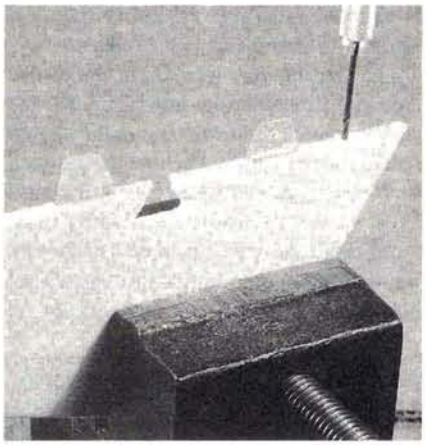
ENGINE AND RADIO INSTALLATION

Because the engine mount bolts provided were not quite long enough to secure my good old O.S.* .25, I reverted to time-honored sheet-metal screws. The fiberglass cowl is a very good one, and the manual suggests using a Dremel tool for trimming. Fuselage, mount, engine and cowl fit together as slick as a whistle! Not only that, but the canopy also settled into place just as it should, which is always a surprise to me!

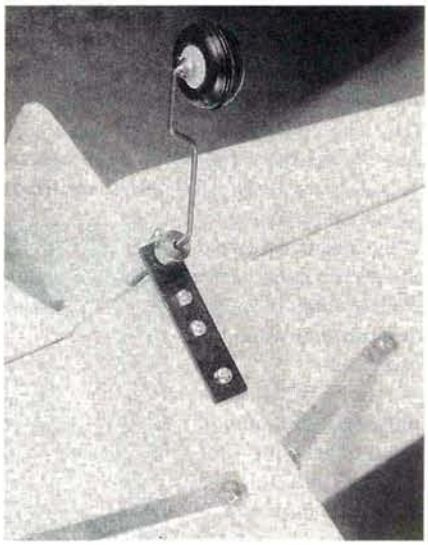
At first, installing the fuel tank was a head-scratcher. The tank is rectangular and, according to the manual, should be installed with the widest part across the fuselage. Sounds simple, but the tank will only fit through the forward bulkhead sideways, and when it's through the bulkhead, there isn't enough room to turn it right-side up! Not only that, but the tank will not meet the hole in the firewall unless installed according to the instructions. My first thought was to trim the opening in the bulkhead to allow the tank to pass; however, that would all but eliminate the vertical sides of the bulkhead. Finally, the solution became clear—a round fuel tank! A round, 4-ounce tank slipped into place as easy as you please and, as a bonus, the throttle line was a cinch to install.

The supplied aileron pushrods had very poor Z-bends. I used a Z-bend tool to correct them, and then they worked very well. Without the tool, it would be best to substitute threaded rods and links to connect the aileron servo to the ailerons. The pushrods to the rudder and elevator, made up as per the instructions, are lightweight and work very well. Radio installation was straightforward in all respects.





Left: the fin fits into a notch in the stab, and the rudder has a cutout to accept the elevator carry-through. Slip the pieces together to mark the area where the covering must be removed to achieve a good glue joint. Below: a 1/16-inch hole is drilled in the rudder with the use of a pin drill and vise. The hole must match the tiller of the tailwheel mount.



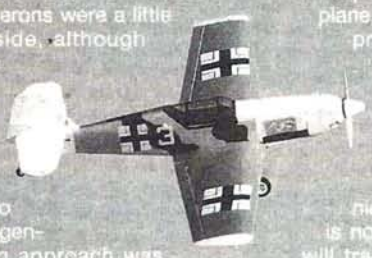
The completed tailwheel shows the mount and the aluminum stab braces installed. The flanges on the stab braces must be slightly bent to match the sides of the fuselage.

Because the engine I used weighed less than the one recommended in the manual, some nose weight was necessary to bring the airplane to the balance point shown. Even with the additional weight, the airplane weighed exactly what the specifications stipulated.

The stick-on decals were easy to apply. The manual says to use canopy cement to glue the exhaust stacks where they belong, which I did. I was very surprised that they survived several flying sessions, but they did! Final balancing and radio and control checks indicated the airplane was ready to fly.

FLIGHT PERFORMANCE

The initial flight was very uneventful. The Me 109 tracked down the runway with only slight right rudder. As soon as it was airborne, I felt very much at home. The only trim necessary was well within the trim range of the transmitter. As I had set them up, the ailerons were a little on the quick side, although after a minute or two, the responsiveness was rather nice. Stalls at altitude proved to be surprisingly gentle. The landing approach was by the book, but since the engine would not throttle down much below 5,000rpm (my fault!), I had to fly it onto the runway and let it run into the grass at the end of the strip to stop! Several days later, when the idle had been properly set, the airplane stalled in nicely for very pretty 3-point landings.



Having only sat in the cockpit of a Spanish Me 109 and having never flown one, I have no idea of the responsiveness of the full-scale airplane. But the Model Tech version will probably do things the full-scale version could not! In fact, with the exception of long vertical and extended outside performance, there is little in the AMA pattern that this model will not do—and do rather nicely. Don't misunderstand: this is not a true pattern airplane, but it will track through rolls, snaps, spins and stalls as long as you do your part. Knife-edge is limited, as are vertical rolls, but with a stronger engine, those could improve. All in all, this is a pretty darn good airplane!

SUMMARY

By and large, the manual provided a logical and well-explained assembly sequence. The woodwork was very well done, as was the covering, and all the major parts fit together very well and required no additional work to align properly. Radio installation was straightforward, and the hardware package included everything necessary to complete the installation. This is a good flying airplane!

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

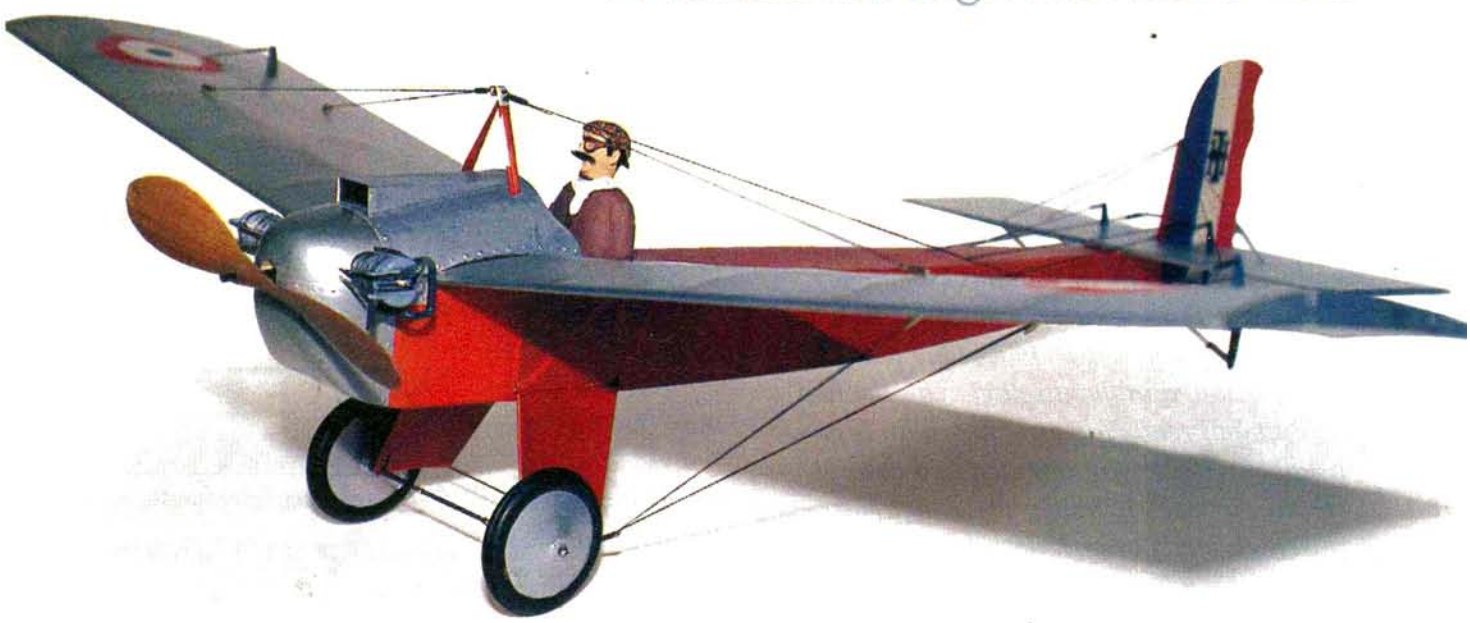
FARMAN MOUSTIQUE

by DON SRULL

A 1920s ultralight in micro R/C

THE NEW BREED of super-small radio and electric-motor equipment makes schoolyard R/C flying more of a reality than ever before. Models no heavier than 6 or 7 ounces, micro radios, small and efficient electric motors, speed controls and batteries are a perfect formula for quiet, small-field flying.

The Moustique (French for "mosquito") is about as simple as a scale subject can get. It was one of the earliest and most successful ultralight aircraft and, because of its typical Farman no-frills simplicity, it resembles a giant model airplane. It's an easy choice for testing new micro equipment and provides the less experienced modeler with an ideal entry to micro electric R/C.

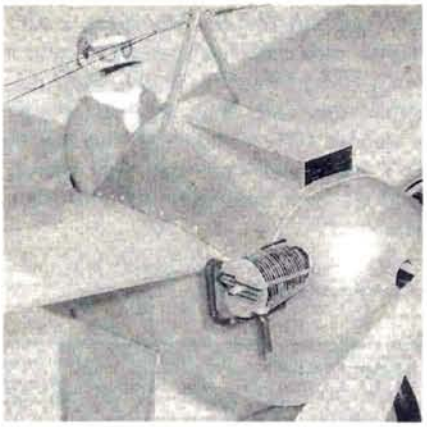


WHAT'S IN THAT LITTLE MODEL?

I used various R/C systems in my prototype. The simplest system had two channels for rudder and motor control, and I later added a third channel for elevator. Both versions fly well, so take your pick.

You should use a receiver that weighs no more than ½ ounce, or 14 grams. I used the 14-gram FMA Direct* 6-channel Tetra FM receiver. Other options include the 14-gram Cannon* 4-channel super micro AM receiver (10 grams without its case) and the new Hitec* 555 5-channel FM receiver (a little over ½ ounce sans case). At 5 grams, the new Garrett* 4-channel FM receiver is a great weight-saver.

I used FMA Direct S-80 sub-microservos, which weigh 10 grams each, but can be lightened to 7 grams if the four long screws and plastic case bottom are removed. They can then be press-fit into a 1-inch-thick block of white foam built into the fuselage—very light and shock-resistant. If you don't want to remove the servo cases, simply stick the servos to the fuselage side with double-sided foam tape.



Carpet-thread wing-rigging cables, a dummy 2-cylinder engine and a French pilot figure dress up the model.

To get the most from this model, I suggest the very light, highly efficient, coreless DC5-2.4 motor from WES-Technik*. A good match for the Moustique is the 6.25:1 gear-ratio motor set number "1b," which is suitable for an 8-inch-diameter prop like the Peck Polymers* plastic prop.

I used the 3-gram Heino Jung ESC, which can handle up to 6 amps—more than adequate for the largest motors I might put into the Moustique.

The WES-Technik geared motor with an 8-inch prop will draw about ½ amp on 6 volts. A 6-cell, 80mAh battery, therefore, should provide at least 3 to 4 minutes of full power. I can throttle back and cruise at almost half this power, so flights can last well over 5 minutes—plenty of time for fun flying in restricted areas.

TO THE BUILDING BOARD

The Moustique is of conventional stick-and-tissue construction—not unlike the typical rubber-powered free-flight model. Since weight is of great importance, refrain from beefing up or reinforcing the structure beyond what is shown. Use lightweight balsa (around 6 pounds per cubic foot) for the structure and firm, straight-grained stock (8-pound wood) for the fuselage longerons and wing and stab spars.

Build the fuselage sides and join them with crosspieces to form the basic box structure. Add firewall former F-1. Make former F-2, carefully gluing the ⅛-inch-square cabane guides into place, but don't attach F-2 to the fuselage yet. Add the 1/32-i.d. aluminum tubes that will hold the landing-gear legs. Make the landing gear out of 1/32 piano wire, and solder it using the 1/32 aluminum tubes in the fuselage as a jig. Note that the axle is attached to the gear crosspiece only at its center, providing an effective shock-absorbing system.

Sheet the bottom of the forward two fuselage bays with 1/32 balsa. Rough the nose block/cowl out of a soft balsa block. Tack-glue the block to the fuselage, and shape and sand it to final form. Remove it from the fuselage and hollow it out to a thickness of about ⅛ inch. Add a few coats of clear dope inside and out, and glue the motor to F-1 using "airplane" glue so it can be removed later if necessary. After the glue has dried, glue the nose block into place. Make sure you have 1 or 2 degrees of downthrust and that the motor wires pass through a hole in F-1 into the cockpit area.

Before setting the fuselage aside, drill small holes in the rear fuselage sides for the control cables to pass through. Short lengths of plastic tubing can be used to reinforce these holes and act as cable guides.

The wing and tail surfaces are very straightforward; use firm, straight pieces of balsa for the leading edges and spars of the wing, stab and elevator. The all-flying rudder should be cut out of very light 1/16-inch balsa sheet.

Install the servo (or servos) at the very rear of the cockpit opening. Press-fit them into a 1-inch-deep white-foam block that has been glued into the cockpit area or, if you prefer, use double-sided foam tape. If you use tape, line the cockpit walls with 1/32 balsa. Fit the receiver, ESC and battery into the forward cockpit area, and position the on/off switch and an external charge jack on the bottom of the forward fuselage bay. Check the radio and motor operation to be sure everything is hooked up correctly.

SPECIFICATIONS

Model: Moustique

Type: semi-scale micro flyer

Designer: Don Srull

Wingspan: 26 in.

Length: 21.5 in.

Wing area: 150 sq. in.

Weight: 5 oz.

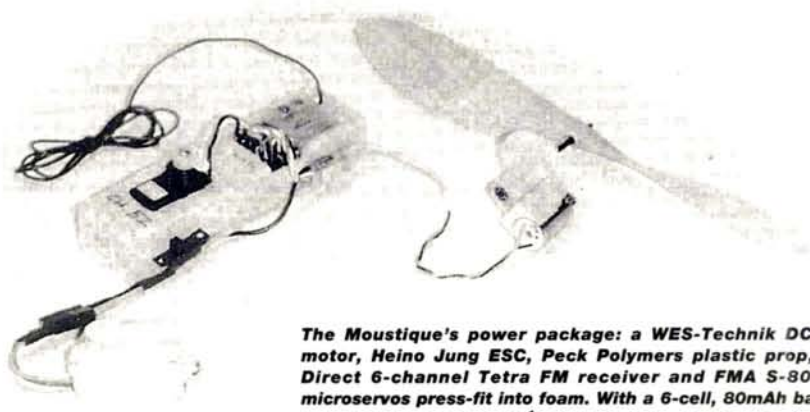
Motor used: WES-Technik coreless, DC5-2.4 geared

Radio req'd: 2- or 3-channel (throttle and rudder; elevator optional)

Comments: the Farman Moustique is just the ticket for free-flighters who would like to fly in that very small field down the street when gentle breezes make free-flight too risky. Even the more experienced big R/C airplane guys will enjoy this little model that can be tossed into the car for a few quick flights at lunch hour—no hassle and no serious support equipment!

LET'S GET DRESSED

Sand the airframe to remove any rough spots, and brush on two coats of thin dope. Cover the entire model, including the solid balsa rudder, with lightweight Japanese tissue. When you cover the fuselage, cover the sides and top first. With the bottom still uncovered, string the control cables though the lead-outs, through the servo-arm holes,



The Moustique's power package: a WES-Technik DC5-2.4 motor, Heino Jung ESC, Peck Polymers plastic prop, FMA Direct 6-channel Tetra FM receiver and FMA S-80 sub-microservos press-fit into foam. With a 6-cell, 80mAh battery, the Moustique can fly at ½ throttle for more than 5 minutes.

and around the servo-arm screw. I used heavy black carpet thread, but nylon monofilament leader would also work. Leave enough thread hanging outside the fuselage to allow you to attach these cables to the control horns later.

Now cover the fuselage bottom. Cover the landing-gear legs with bond paper, and attach the gear to the fuselage.

Shrink the tissue covering with water or, better yet, rubbing alcohol. Pin down the wing and stab to prevent them from warping. Add the ply control horns to the rudder and elevator, and brush two or three layers of thin, low-shrink dope, such as Sig* Lite-Coat, onto the covered surfaces.

I sprayed two very light coats of colored butyrate dope over all the surfaces. By the way, I used Bill Hannan's* great little "Model Plans & Three-Views Intl., Issue 1" as a source of scale details, color and markings. My Moustique's wings and stab are doped aluminum, and its fuselage is a dark wood color. The wing roundels are colored, tissue disks.

PUTTING IT ALL TOGETHER

Attach the rudder to the rudder post with thin, flexible hinges such as Sig Easy Hinges. I use white glue rather than CA to hold the hinges in place, as white glue is more flexible. If your model will have elevator control, hinge it as well.

Glue the stab and elevator into place on the fuselage. When they've dried, string the control cables through the control horns. Before permanently attaching the cables, turn on your radio and make sure the servo trim knobs are centered. Turn off the radio and snug up the cables, making sure the elevator and rudder are centered. The cables shouldn't be too tight—just snug. Use a spot of airplane glue to secure the cables in the control horns, and trim off the excess thread.

Carefully glue the wing into place. When it is dry, add former F-2 to the top of the main spar. Cut the two cabane pieces out of firm 3/32x3/16-inch balsa, and trial-fit them into place and into the F-2 guides. Remove the cabane pieces and cut out and fit the bond-paper cockpit fairing. Coat the fairing with three or four layers of thin clear dope; let it dry, and then add a few coats of aluminum dope. Now carefully attach the fairing with white glue. Slide the painted cabane pieces into place through holes in the fairing, using a little white glue to permanently anchor them.

Add black, carpet-thread, wing-rigging cables and any other scale details you wish. To simulate the Moustique's ABC Gnat 2-cylinder engine, I built a dummy engine out of Peck plastic cylinders and scrap balsa. It adds quite a few grams but helps preserve the simple model's scale appearance.

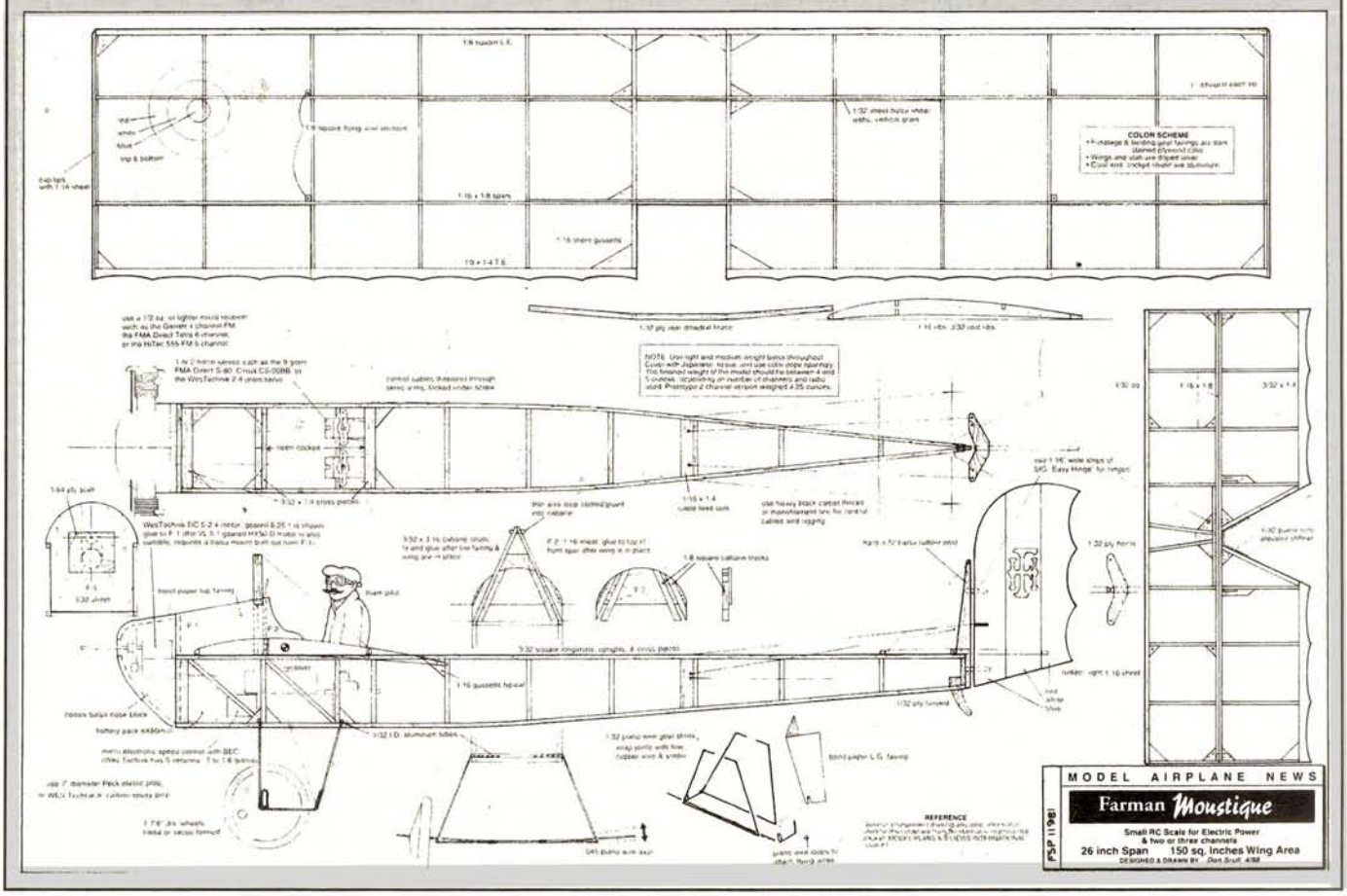
IN YOUR BACKYARD

As always before the first test flights, make sure that the flying surfaces aren't warped. Check the balance point, and shift equipment or add ballast if necessary to get the CG within 1/4 inch of the point shown on the plans. The control throws should be about ±3/8 inch for the rudder and ±3/16 inch for the elevator.

That's it! Charge up the battery and fly. You will find the Moustique a very docile, well-behaved sport flyer with a really classy look. Like its full-size counterpart, the model is not aerobatic, but on a smooth surface, takeoffs, touch-and-go's and landings are pretty impressive. And whoever thought you could like a mosquito?

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.* ✚

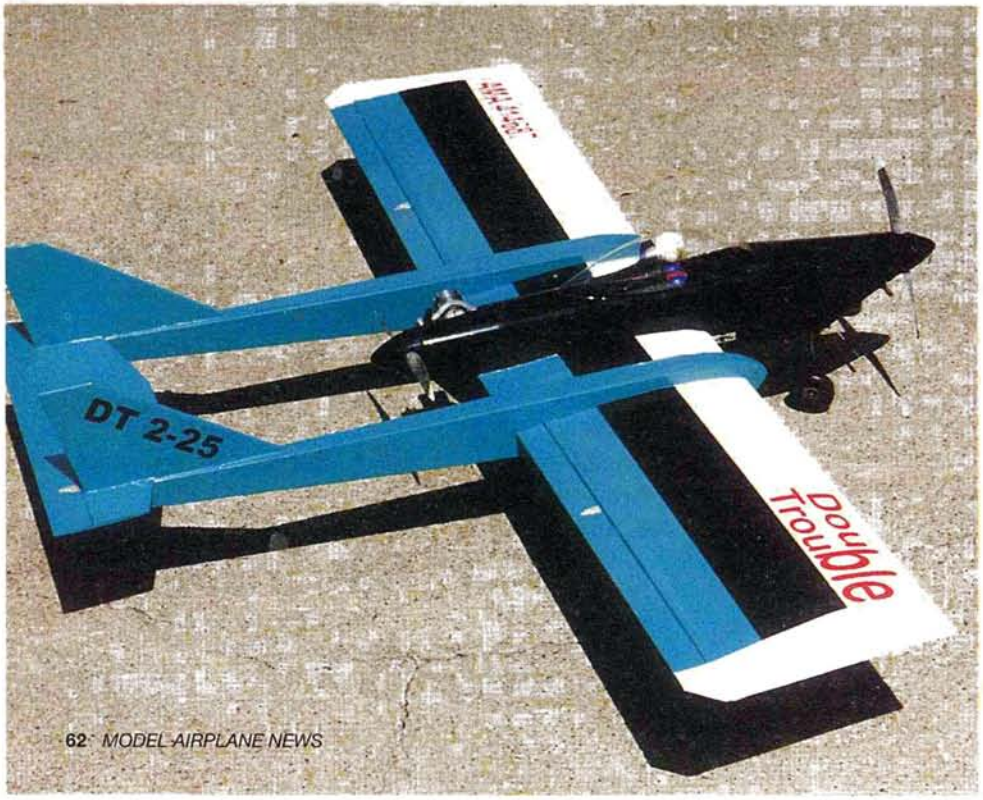
To order full-size plans (FSP11981), see Pilots' Mart, page 111.



by TONY NEWSOM

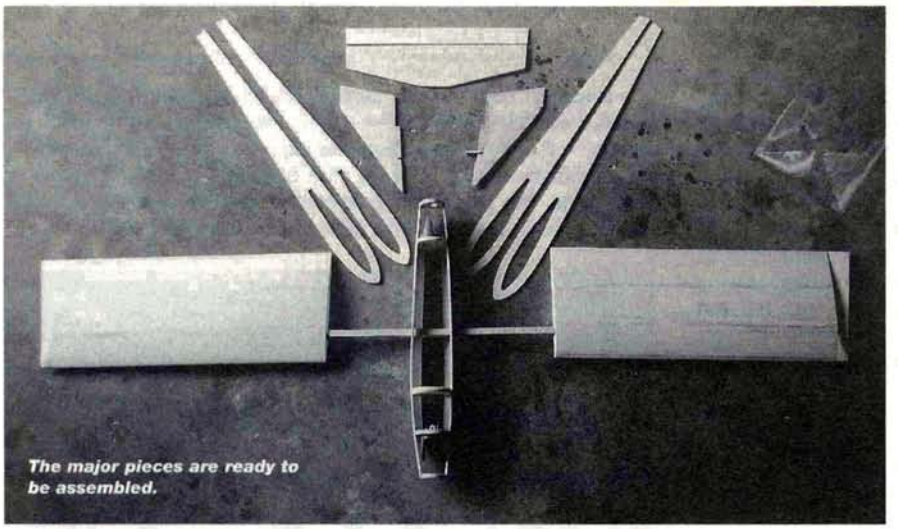
DOUBLE TROUBLE

A new twist in twin engines



I've always been attracted to things that are unconventional. I wanted a sporty airplane that was fun to fly and that looked and sounded a little different—something that would attract attention and spark conversation at the field. Add to that my desire for an R/C plane with two engines, and the result is Double Trouble. Both engines are mounted on the same thrust line; one engine pushes while the other pulls. Mounting the engines this way has many benefits: torque steer is just about eliminated because the props turn in opposite directions; there are no extreme yaw characteristics if one engine stops running; and you can use engines of various brands and displacements and different props.

PHOTOS BY TONY NEWSOM



The major pieces are ready to be assembled.

SPECIFICATIONS

Name: Double Trouble

Type: sport twin

Wingspan: 51 in.

Length: 40½ in.

Wing area: 535 sq. in.

Wing loading: 22.5 oz./sq. ft.

No. of channels req'd: 4

Airfoil: semisymmetrical

Weight: 5¼ lb.

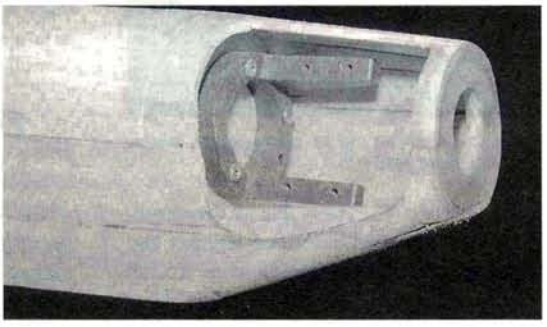
Engines recommended: two .25 to .36 2-strokes

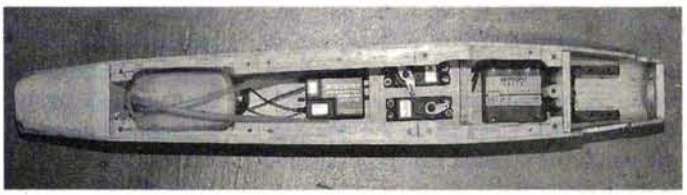
Features: this is a sporty airplane that is fun to fly and that looks and sounds a little different. Both engines are mounted on the same thrust line; one engine pushes while the other pulls.

Two fuel tanks in the fuselage reduce the chance of both engines running out of fuel at once. In more than three years of flying Double Trouble, I've never had a dead-stick landing.

FIRST THINGS FIRST

The plans show the engines mounted inverted (the way the first Double Trouble was constructed). When I built the second plane, I inverted the front engine and mounted the rear engine on its side, placing the pistons at a 90-degree angle to each other to reduce vibration because the pistons can never travel in the same direction. By comparison, when the pistons are mounted in parallel, severe vibration can occur if both pistons go up or down simultaneously. Which is better? I flew the first version for more than three years and 200 flights, and vibration was never a problem. With both engines inverted, the fuselage looks better and is more aerodynamically clean. The choice is yours.





Top: a closer look at the rear engine compartment and mount. Bottom: here are the throttle and steering servos, receiver, battery pack and rear fuel tank. The front tank fits over the battery pack.

You can use a single servo and flexible cable for the ailerons, but I recommend using one servo in each wing. Two servos give you more positive control and if one servo fails, the second servo will maintain control.

FUSELAGE CONSTRUCTION

The fuselage sides are cut out of ⅛-inch medium balsa. The sides are only 2 inches high from the bottom to the centerline/thrust line. The rest of the fuselage will take shape when you wrap two layers of 1/16-inch balsa sheeting over the formers. Use thin CA to construct the fuselage.

Cut the fuselage sides, being careful to cut the spar slot according to the plan. This slot is slightly slanted to give the wing 1 degree of positive incidence. Also cut a ½-inch hole on each side to run the wing servo wire into the fuselage. Drill the hole for the antenna tube in one side. Cut out formers F1 to F5 and draw centerlines on firewalls F2 and F4. Decide which way you want to mount the engines because now is the time to drill holes and attach the engine mounts to F2 and F4. Attach the nose-gear mounting hardware to F2. Make sure the engine mounts are on the centerline. Drill all the necessary holes for fuel tubing and linkages. Glue the fuselage together. After I made sure everything was square, I used thin CA to glue in all the formers. Install the ¼-inch landing-gear plate; cut it to size and glue ½-inch triangle stock flush with the bottom edge of the fuselage sides and running from F2 to F4. Glue ¼-inch triangle stock into both engine compartments.

Complete the top of the fuselage with 1/16-inch balsa sheeting. You can use thin CA to glue two 3-inch-wide pieces together edge to edge. Use two pieces of lightweight cardboard to make templates for the curved upper fuselage. When you're satisfied with the templates, lay them on the balsa and cut them out. You will need two more pieces of balsa for the second layer. Spray the balsa sheet with a 50/50 solution of water and rubbing alcohol, and wait a few minutes for the wood to become very pliable. While holding the fuselage upside-down, wrap the sheeting over the formers, starting at F1. Cup your hand around the balsa and the former and use thin CA where the formers contact the sheeting. Keep the sheeting tight against the formers as you apply the CA. You may

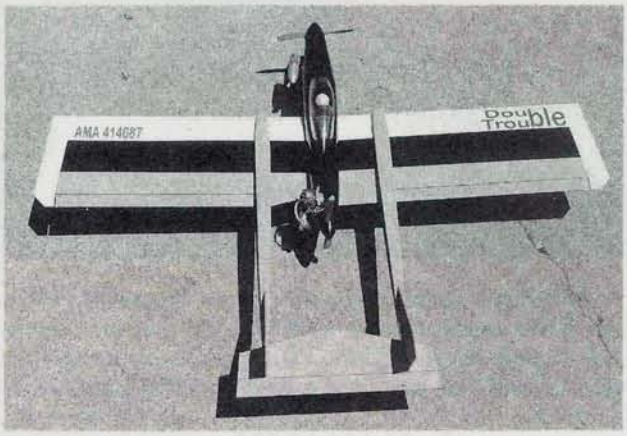
The booms slide over the sheeted wing. The boom sheeting is left open until the booms are glued into position.

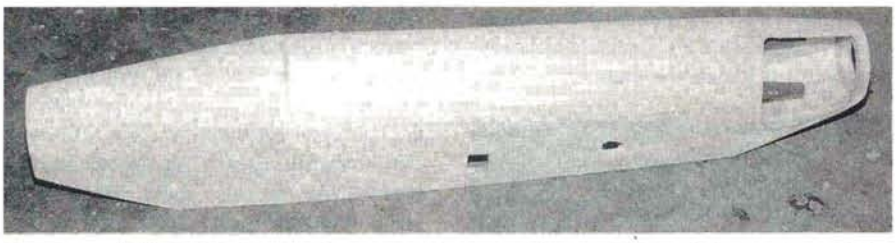
FLIGHT PERFORMANCE

Taxi out to the runway centerline and advance the throttle slowly. The plane should track straight and pick up speed quickly. Let it roll for a while and then pull back slightly on the elevator stick to rotate. The static thrust with two props is impressive. Having two motors does not mean you can go twice as fast, but you can point its nose straight up and it will just keep going until you tell it to stop. Loops and rolls are no problem. My model moves along at about 80mph with the 9x6 props installed. With 8x6 props, the speed increased to close to 100mph. The smaller props also cut the fuel burn time in half (6 minutes on 4 ounces as opposed to 12 minutes). I prefer the larger props.

The Double Trouble will fly on only one motor, but if the rear motor dies early into a flight, you should set up for landing. If the rear motor stops, the fuel in the rear tank is not being burned off. As the front motor continues to run, the front tank will get lighter; this could make the plane tail-heavy. On the other hand, if the front motor dies early, you can actually continue to fly without worrying about balance. The model will be a little nose-heavy, but that won't hurt you. If you get all your adjustments correct, you will not encounter any tail-heavy situations.

To land with both motors running, especially if you have them adjusted so they will idle down pretty low, simply pull the stick back to ¼ throttle on the downwind leg, make your final turn and line up with the runway. Pull the stick back to idle and just let the plane settle. The sink rate is predictable, so all you have to do is use the elevator to control how steep the descent will be.





Two layers of 1/16-inch balsa sheeting are used to create the rounded top of the fuselage. Notice the spar slot and hole for threading the servo leads into the fuselage.

want to hold a piece of wax paper between your hand and the fuselage in case some of the glue seeps through the wood. Put a couple of rubber bands around the pieces until the glue and the wood have dried. Repeat the same steps for the rear of the fuselage.

Drill ⅛-inch holes about 1 inch apart through the first layer of sheeting from front to rear. Spray the second layer of 1/16-inch sheeting and wrap it over the first. While holding the second layer in place, start at the front of the inside of the fuselage and drop CA into the holes you drilled through the first layer. The CA will wick into the second layer of sheeting and laminate the layers, and this will make a very sturdy, rounded fuselage top.

FLYING SURFACES

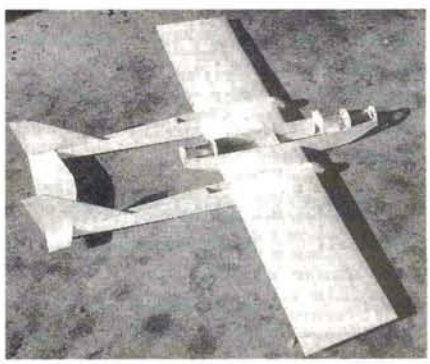
The wing has a constant chord and is constructed with a foam core covered with 1/16-inch balsa sheeting. Each wing half houses a mini-servo connected to the aileron. A balsa servo box is inlaid in the core for servo mounting. The core has hard balsa leading- and trailing-edge stock with balsa ailerons. The main spar is two pieces of ¼-inch plywood laminated together and glued into the slot cut into the core. To run your servo leads into the fuselage, bore holes in the cores from the root out to the servo boxes. Glue the spar into only one wing half for now. Use a soldering iron to melt a small groove in one of the cores from root to tip just deep enough to hold a small-diameter plastic tube that the antenna wire will run through. I used 3M spray adhesive to attach the wing sheeting to the cores.

The booms are cut out of ⅛-inch medium balsa. The top and bottom use 1/16-inch balsa with the grain as shown on the plan. Be as precise as possible when cutting the opening for the wing in the boom sides. This should be a snug fit over the sheeted wing. One of the booms will house the servo and the control wire that goes to the elevator. The top and bottom sheeting for the booms should be left open directly over the wings until after the booms have been glued into position.

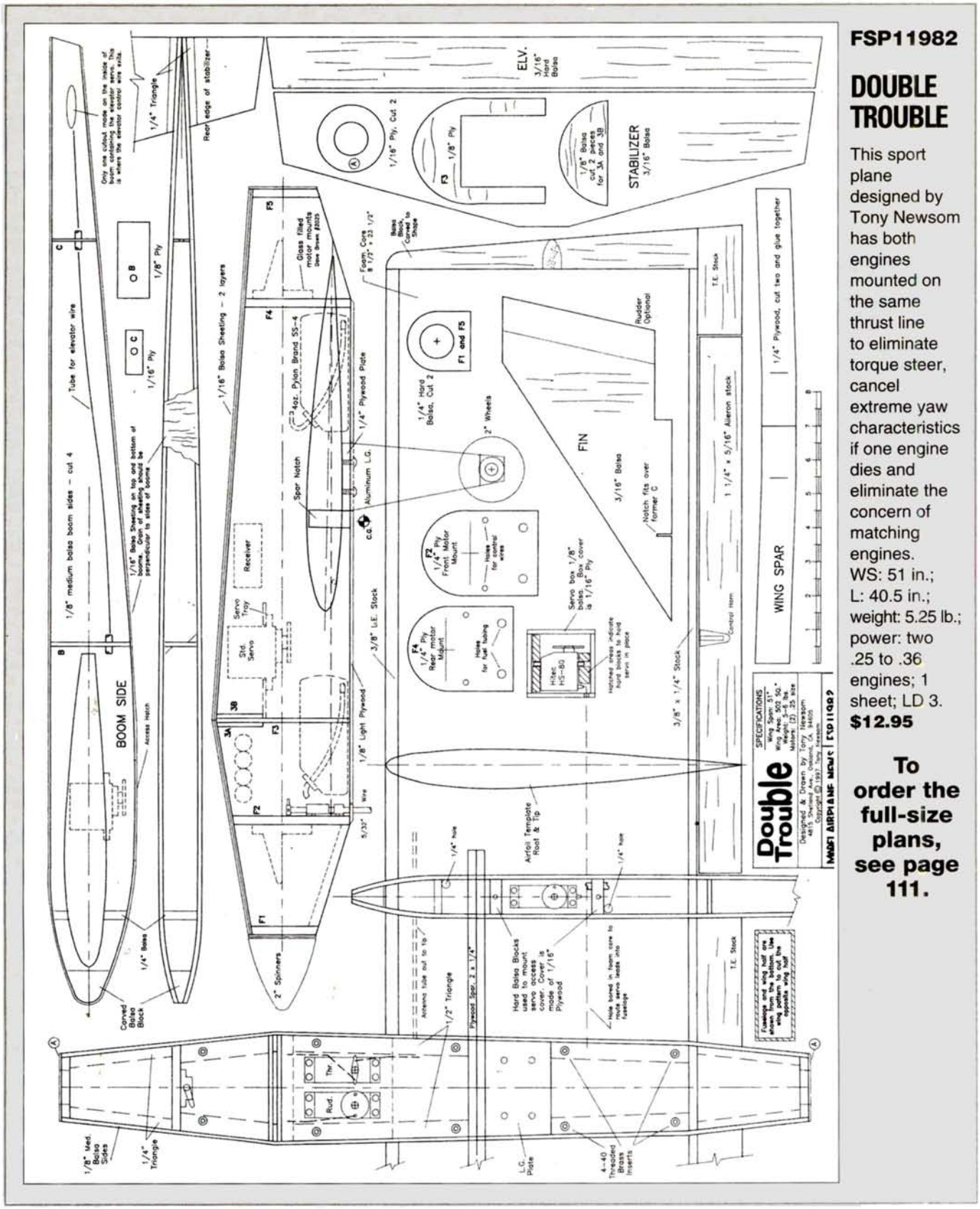
Use 3/16-inch balsa for all tail surfaces. It is important that the elevator be cut out of hard rigid stock because the control horn has to be installed close to one end. Cut the stabilizer out of 4-inch-wide material. Round the leading edge (LE) with sandpaper. Glue enough material together, edge to edge, to cut out two fins. Cut the notch in the fin as shown on the plan. Round the LEs of the fins using sandpaper.

PUTTING IT ALL TOGETHER

Use a small screwdriver to make multiple score lines on the side of the fuselage where the wing root will contact it. This gives the epoxy a little extra bite and makes the joint stronger. Slide the booms onto the wings from the root end. Apply 30-minute epoxy to the wing root and the side of the fuselage. Insert the spar through the slot in one side of the fuselage, making sure it is pushed all the way up to the top of the slot. Put a clamp of some type on the spar sticking out of the other side so everything will hold together until the epoxy cures. Now do the same for the other wing, making



The parts are trial-fit together.



FSP11982

DOUBLE TROUBLE

This sport plane designed by Tony Newsom has both engines mounted on the same thrust line to eliminate torque steer, cancel extreme yaw characteristics if one engine dies and eliminate the concern of matching engines. WS: 51 in.; L: 40.5 in.; weight: 5.25 lb.; power: two .25 to .36 engines; 1 sheet; LD 3. **$12.95**

To order the full-size plans, see page 111.

sure its LE is aligned with that of the first wing. Use masking tape to help hold it in place. Let the epoxy cure. Epoxy the booms into place, and when they've dried, epoxy in the stabilizer and fins, making sure everything is square and in alignment.

FINAL ADJUSTMENTS

Adjust the throttles on the engines to get a slow, dependable idle. Start and adjust the rear engine, then shut it down. Remember that the rear engine will heat up quickly because there is no air movement over the head. Start and adjust the front engine and, while it is running, restart the rear engine. The front prop is now supplying airflow over the head of the rear engine. Remember: two props are spinning!

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

MODEL AIRPLANE NEWS
HOW TO

The author spent 18 months building and sanding this P-51.

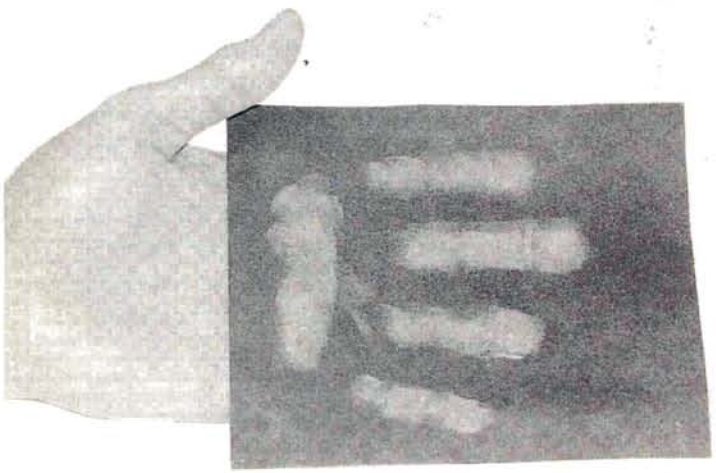
SANDING BASICS

Secrets to surface preparation

by MARIANO ALFAFARA

IT HAS BEEN said that you can measure a builder's skill level—without seeing a model—by examining the sanding tools in his workshop. I have visited many workshops, and I agree that the best builders/finishers use only premium-quality sandpaper and have made a wide assortment of specially designed sanding tools. Of all the skills that we modelers must master, sanding is probably the most important.

To select the correct sandpaper for a given task, we only need to understand the information on the back of the abrasive sheet.



This photo reveals that your hand makes an unsuitable sanding block. The black silicon-carbide paper reveals the uneven removal of material, which results in an uneven surface on the model. A skilled builder uses specialty sanding tools to remove material more uniformly.

Before we can develop good sanding techniques, however, we must be able to select the correct materials for the job. How do you choose the correct sandpaper for a given task? Novice modelers may find the many choices somewhat confusing: production paper, garnet paper, or flint paper? Silicon carbide, emery, or aluminum oxide? Open coat, closed coat, or no-load? What size grit or grade? Wet or dry? What is A, C and D paper?

A little baffling? Possibly, but only if you can't identify the various sandpaper types and designs. Therefore, our objective

PHOTOS BY MARIANO ALFAFARA

is to simplify this selection process by learning about abrasives and their designated applications. The next time you're at the hobby shop and need sandpaper, you'll be able to say something like, "Give me a couple of sheets of open-coat, aluminum oxide, 320-grit, on A paper."

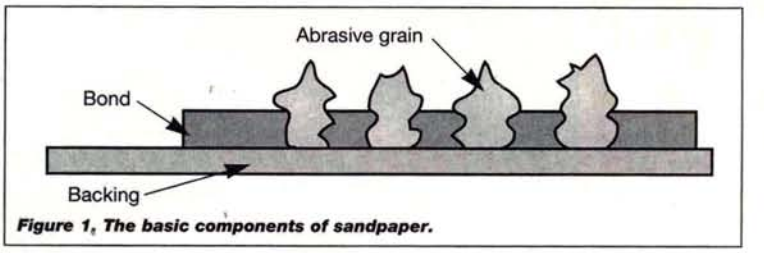


Figure 1. The basic components of sandpaper.

The sandpaper that we model builders use is technically called "coated abrasive sheets." To simplify this discussion, we will continue to use the common misnomer: sandpaper. Three basic components make up sandpaper: an abrasive, a bonding agent and a backing (see Figure 1).

ABRASIVE MATERIALS

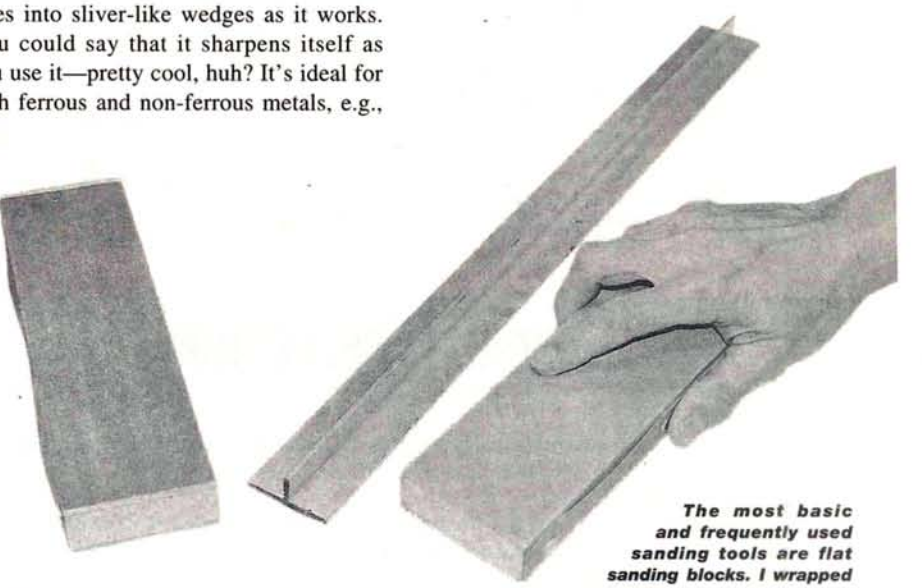
• **Natural minerals (garnet, crocus and emery).** Garnet is a widely used mineral of medium hardness; it has a sharp form and good cutting edges. It's a good choice to use with balsa and other soft woods. It is paper-mounted, orange-brown, economical and readily available. Crocus and emery are cloth-backed abrasives that are designed for metal finishing. Other than polishing the occasional small metal part, there is limited use for these products in our workshops.

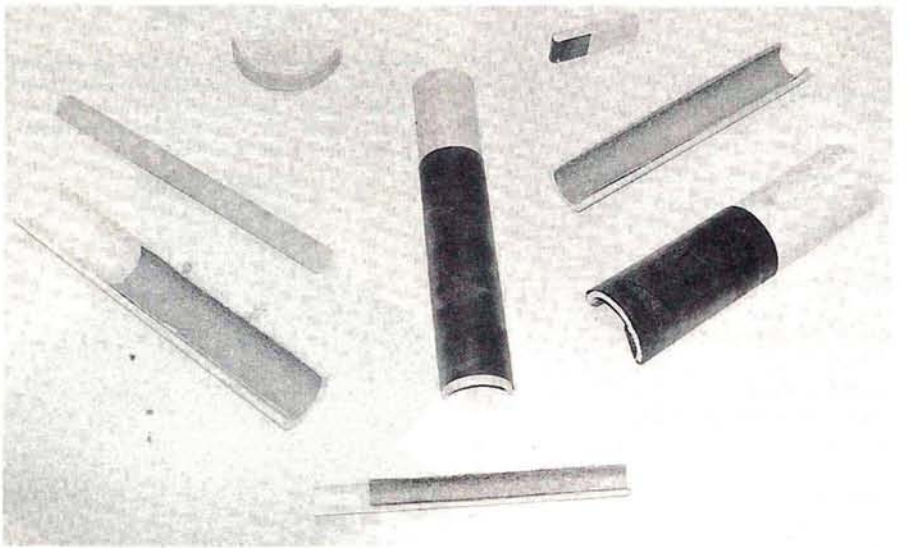
• **Synthetic minerals.** Aluminum oxide and silicon carbide are generally the only two synthetic minerals that suit our modeling applications.

Aluminum oxide is gray-brown, or sometimes gold. It is extremely hard and resistant to wear. 3M markets this abrasive under the trade name of Three-M-ite (not to be confused with their Tri-M-ite). Norton markets its aluminum oxide under the trade name Adalox. I've used both of these paper-backed products on hardwoods, resins and paints with equally exceptional results. Production paper is made with aluminum oxide.

Silicon carbide is the hardest and sharpest of the minerals commonly used in coated abrasives. It is brittle and fractures into sliver-like wedges as it works. You could say that it sharpens itself as you use it—pretty cool, huh? It's ideal for both ferrous and non-ferrous metals, e.g., steel, aluminum and brass, and also for plastic, wood, resin, rubber and both hard and soft paints. Silicon carbide is superior to other abrasives in its capability to penetrate and cut faster under light pressure. This characteristic alone makes it very well-suited to modeling. The 3M trade name for silicon carbide is Tri-M-ite; the Norton trade name is Durite. Both brands are gray. Although it is more expensive, silicon carbide is certainly the abrasive of choice in my shop.

An additional note on types of abrasives: remember flint paper, that sandpaper we used in shop class at school? Well, if you have any of that stuff in your shop, throw it away or give it to someone who does craft projects.


The most basic and frequently used sanding tools are flat sanding blocks. I wrapped a 1x3x11-inch wood block with a full sheet and thumb-tacked it on one side. This sanding tool is easy to hold and control. T-bars, such as the one here, are very effective on long surfaces such as wing leading edges.


Every aircraft has a number of inside and outside radii that need to be shaped and finished (fillets, wingtips, leading edges, etc.). Here are some radii sanding and shaping tools that I made from dowels, plastic pipe cut lengthwise, or whatever else I could find to match the specific radius I was forming.

COAT TYPES

Abrasives are coated onto a backing by two methods: open coat and closed coat. Open coat indicates that the abrasive grains cover 40 to 70 percent of the backing. If the material being removed has a tendency to load or clog, an open-coat sandpaper is the proper choice. Loading is the tendency of the material being removed to build up on the abrasive grain. We should use open-coat sandpaper for most of our modeling needs. Closed coat indicates that the abrasive grains cover 100 percent of the backing.

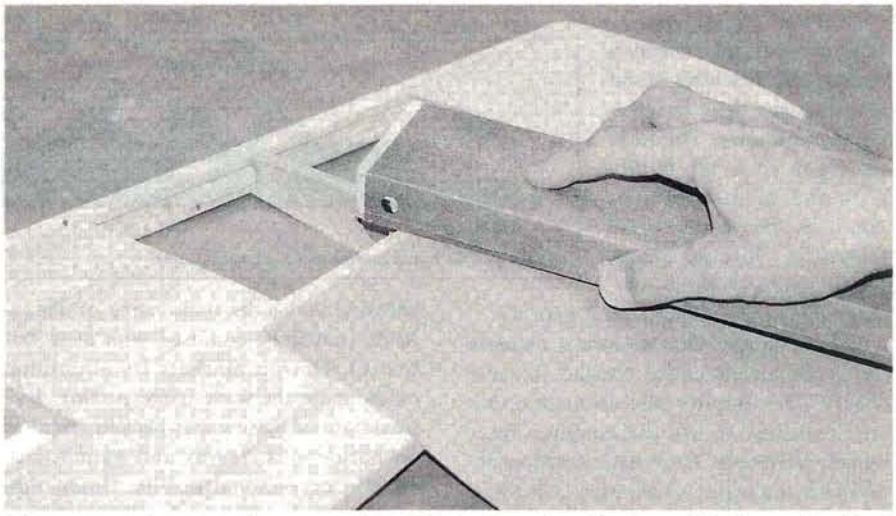
SANDING BASICS

A closed coat is the proper choice when loading is not a problem, such as in metal finishing.

WET SANDING

For wet sanding, a waterproof bonding agent is used with silicon carbide. The 3M trade name is Wet-or-Dry Tri-M-ite; Norton calls it Tufbak Durite. Both are black. As their names imply, they can be used in either wet or dry sanding applications. These products really excel at wet sanding, however.

An aerosol-applied adhesive is ideal for attaching sandpaper to wood or plastic tools. Note the sandpaper glued to the bottom portion of the can; its diameter was an exact match to the diameter of an open cockpit on a Ryan STA that I was building. The can was the perfect tool to sand the edges of the cockpit opening.



The paper mask protects the rear portion of the leading-edge sheeting, while the sanding block levels the uneven rib capstrip.

With the non-clogging action provided by water and the superior cutting ability of silicon carbide, these papers can quickly remove a lot of material.

The makers of Hobby Poxy* paint recommend that you do not dry-sand their paints with wet/dry paper. They feel that the waterproofing agents in the paper could get on your finish and interfere with paint adhesion. I have used this sandpaper both wet and dry and have not had any problems, but caution is advised. In any case, you should always wipe the model surface with alcohol or thinner after sanding to remove any residue.

BACKINGS AND BONDS

Backings are the platforms that carry and support the abrasive mineral grains. There are five categories, but we are

SANDPAPER SELECTION

When you select sandpaper, remember the following factors:

- **Material to be removed.**
  Hard or soft wood, resins, plastic, paints? Will the material load or clog the abrasive? The answers will determine which abrasive and type of coat you'll need.
- **Shape of working surface.**
  Flat, compound curve, or radius? These factors will determine a backing selection.
- **How much material is to be removed; what kind of final finish is desired?**
  This will determine grade or grit selection.
- **Will you wet-sand?**
  You will need a waterproof bond.

SELECTION OF ABRASIVE MINERALS

Abrasive (color)	Applications
Garnet paper (orange/brown)	All types of soft wood
Aluminum oxide (gold/brown)	Wood, resins, sealers, paints, primers
Silicon carbide (gray)	Wood, resins, sealers, paints, primers
Emery (black)	Ferrous and non-ferrous metals

Suggested applications for wet-sanding

Silicon carbide (black) (3M Wet-or-Dry, Tufbak Durite)	Lacquer, paints, resins

Selection of paper-backing weights

A-weight	Compound curves and radii
C- and D-weights	Flat work

Selection of grades (grit)

50, 60 and 80 grade	Heavy stock removal
100, 120 and 150 grade	Medium stock removal
180, 220 and 240 grade	Light stock removal
280, 320, 360, 400 and 66 grade	Finishing

Sponge or foam sanding pads are used only after your surface has been sanded with sanding tools. Sanding pads should be used only to remove glaze and minor imperfections on relatively smooth surfaces.

concerned only with paper, and occasionally cloth-mounted emery. Paper backings are classified by their weight as A, C, D, E and F.

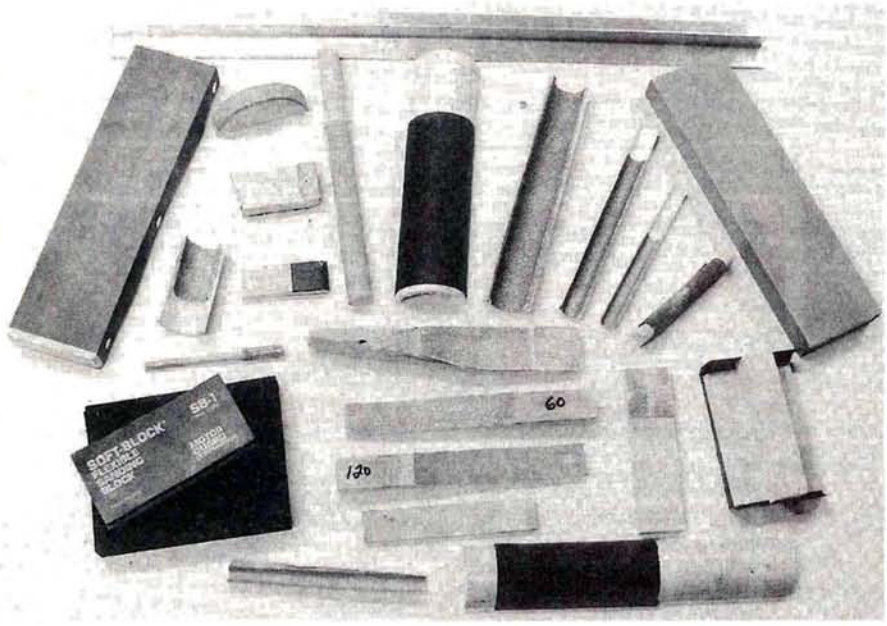
• **A paper.** The lightest and most flexible paper, coated with fine mineral grains.

• **C and D paper.** Intermediate-weight paper, coated with medium mineral grains.

• **E and F paper.** The heaviest papers; can be coated with almost all grit sizes.

I want to use sandpaper with a backing that will conform to curves and radii, so in most instances, I use A-weight paper. I use C- or D-weight sandpaper on straight, flat sanding fixtures such as sanding blocks and T-bars. (By the way, there isn't a B weight; I don't know why.)

Bonds are two or more layers of adhesives that anchor the abrasive mineral to the backing. There are many types, including combinations of glues and resins. Bonds are a significant factor in the performance of the abrasive. As modelers, however, we select a sandpaper by its abrasive mineral, grain and backing, not by the bond. Therefore, you need only know that for wet-sanding you will need a waterproof bond such as 3M Wet-or-Dry, Tri-M-ite or Norton Tufbak Durite.



You should have a wide assortment of sanding tools in your shop. Here are some of the tools that I made and used to build my all-wood P-51.

GRADES

The grade size refers to the size of the abrasive mineral grain. This size is determined by the number of grains that will fall through a designated number of openings in a screen mesh per square inch. There are 22 grit sizes, or grades, as they are commonly called. They range from the coarsest (12 grade) to an extremely fine powdered form (1,500 grade). Modelers usually use grades of 60 to 80 for rough stock removal and up to around 400 to 600 for those super finishes that you see in the winners' circle at major contests. Grades finer than 600 are rarely used in our hobby; nevertheless, my friend George Maiorana used 1,500-grade wet or dry sandpaper on the clear acrylic windows and gun blisters in his Top Gun B-29. There are other exotic grades designed for very special applications; I once read that NASA uses a 50,000 grade.

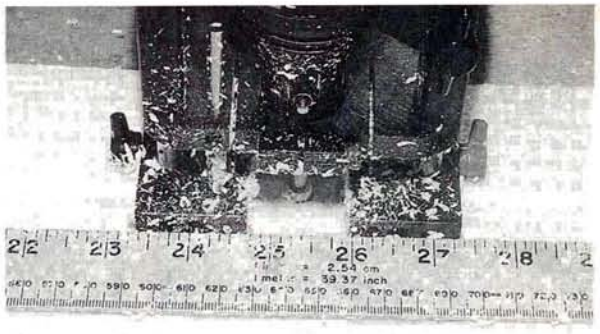
SUMMARY

Whether you're preparing an airframe for paint or iron-on covering, nothing can hide or cover up a poorly sanded surface. Many aspiring builders often underestimate the significance of this fundamental skill. When I asked Darrell Rohrbeck to summarize his experience building his magnificently finished ¼-scale Long EZ, which won first place at Toledo '97, he recalled that the project was "... about 10 percent building and 90 percent sanding."

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

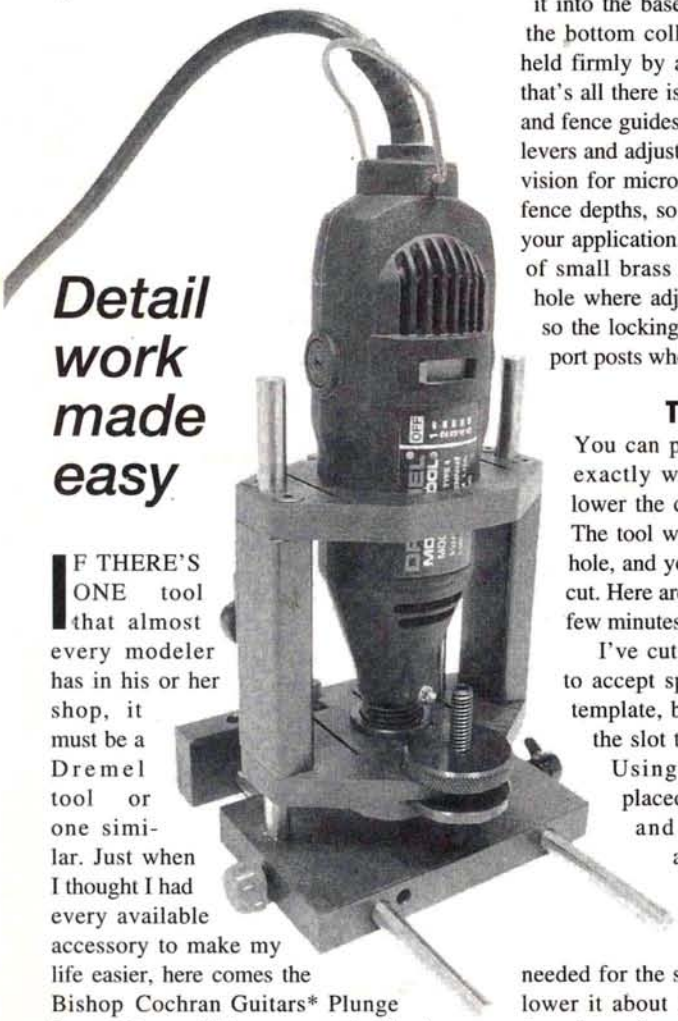
MODEL AIRPLANE NEWS

PRODUCT REVIEW



BISHOP COCHRAN GUITARS Plunge Router Base

by GREG GIMLICK



Detail work made easy

IF THERE'S ONE tool that almost every modeler has in his or her shop, it must be a Dremel tool or one similar. Just when I thought I had every available accessory to make my life easier, here comes the Bishop Cochran Guitars* Plunge Router Base, which converts the fixed-base Dremel tool into a true plunge router.

Bishop Cochran is a guitar builder who couldn't find the right tool for doing fine inlay work and rosettes, so he designed his own. The very sturdy unit is machined out of anodized aluminum with 01 premium-ground steel posts and guides. If you've used a plastic router attachment, you know how it can flex and loosen, but the Cochran base has a beefy feel and absolutely does not flex.

The Dremel tool is mounted by removing the plastic threaded collar and inserting it into the base, where it is screwed into the bottom collar. The top of the tool is held firmly by a clamping upper support; that's all there is to it. To change the depth and fence guides, simply loosen the locking levers and adjust the guides. There is a provision for micro adjustments in height and fence depths, so you can fine-tune them to your application. Of special note is the use of small brass "plugs" in each threaded hole where adjustments have been made, so the locking screw won't mar the support posts when it's tightened.

THE BENEFITS

You can position the plunge router exactly where you want and then lower the cutting tool into the work. The tool won't waver or elongate the hole, and you can make a very precise cut. Here are some things I did in just a few minutes, with excellent results.

I've cut slots in foam wing-cores to accept spars using a hot wire and template, but that required that I cut the slot the full length of the core. Using the Cochran base, I placed a steel ruler on the core and positioned the router against it to use as a guide. I set the vertical stops to allow the cutter to go only as deep as I needed for the spar material and began to lower it about 3 inches from the end of the wing, where I wanted the spar to end. The router is so strong that I easily controlled it with one hand while I held the ruler/guide with my other hand, and cutting an exact slot took less than 5 minutes. With the right cutter and the depth set with the vertical stops, I ended up with a clean, straight slot with a nice, square bottom. I did the same thing in a sheeted core, and it was even easier.

My next operation was to cut around servo hole in the foam core to accept a round, European servo-mounting system. Ordinarily, this would be a nightmare, but it proved to be as easy as the straight cut. I flipped the fence guide over so the circle guide was toward the work surface and set the radius of the circle using the horizontal adjustment knob. When I knew where I wanted the circle to be, I pushed the circle guide into the foam and rotated the tool around it. I expected some drift in the foam, but the base is so solid that it wasn't a problem. When the outline hole had been cut to the depth I wanted, I removed the fence and routed the excess foam from the center of the circle.

Next, I routed windows into mock fuselage sides (using old Formica templates) and trimmed leading and trailing edges. One of the key elements to making the most of this tool is to accumulate various small router bits and bearing guides; if you can't find the 1/8-inch shaft you need, a machine shop can cut one down for a small fee.

When I first heard about this base, I thought, "Gee, that's expensive," but after I had used it for a couple of weeks and compared it to other available bases, I changed my tune. It's custom-made for detail work. If you're looking for a high-quality tool that will outlast your Dremel, this is the base for you. Bishop Cochran is available via email or phone for technical help and is developing a base for Ryobi tools, too. Am I impressed? You bet!

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

SPECIFICATIONS

Name: Plunge Router Base

Manufacturer:
Bishop Cochran Guitars

Price: $147.50

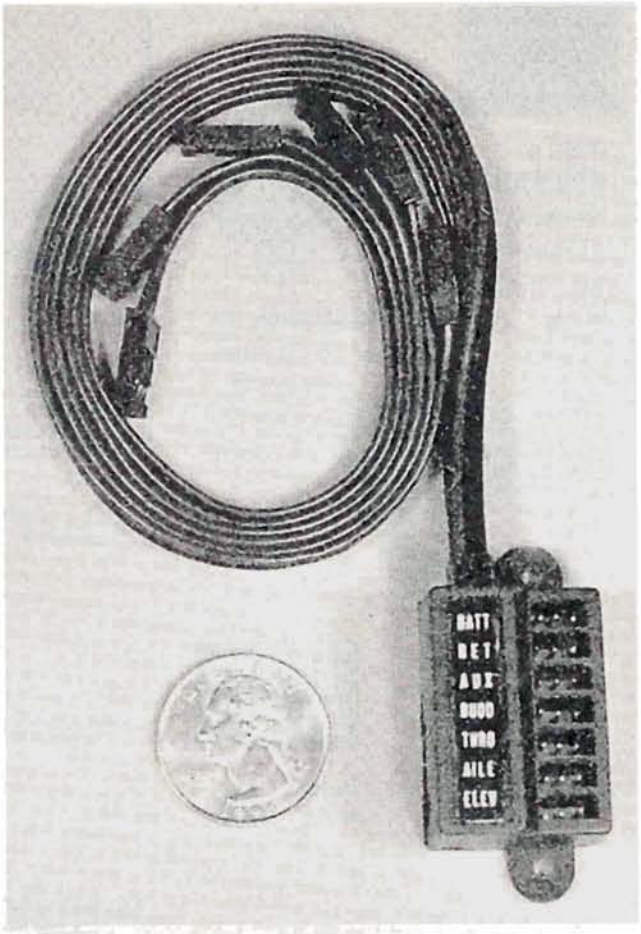
Features: smooth vertical-screw adjustment, lock and depth stop and screw-adjustable, removable fence for circle-cutting tasks.

Comments: I am excited about the possible applications of this tool in my modeling. I really wish I had had it when I used to do a lot of woodworking because it is custom-made for detail work.

MODEL AIRPLANE NEWS HOW TO

by FAYE STILLEY

Assemble a Servo Power Connector



PHOTOS BY FAYE STILLEY

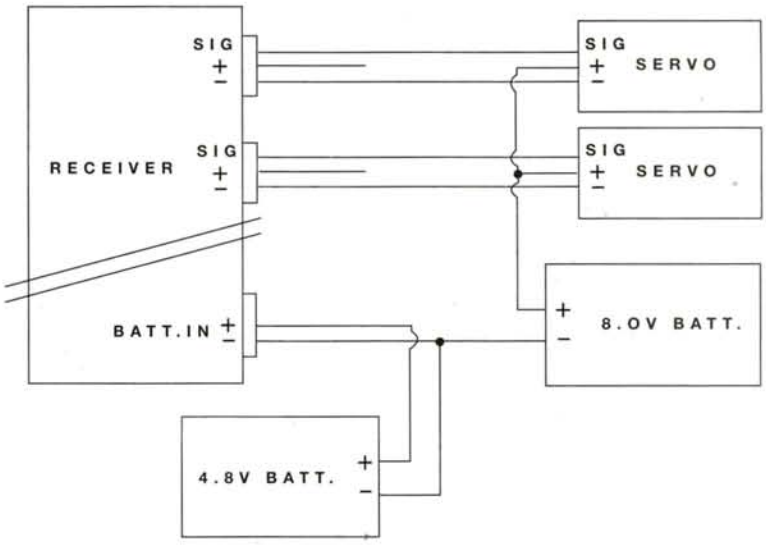
WHAT IS A SERVO power connector? It's a device that does good things when you plug it in between the receiver and servos. As model airplanes get bigger, servos get bigger and stronger, and more are used.

Protect your receiver from electronic "noise"

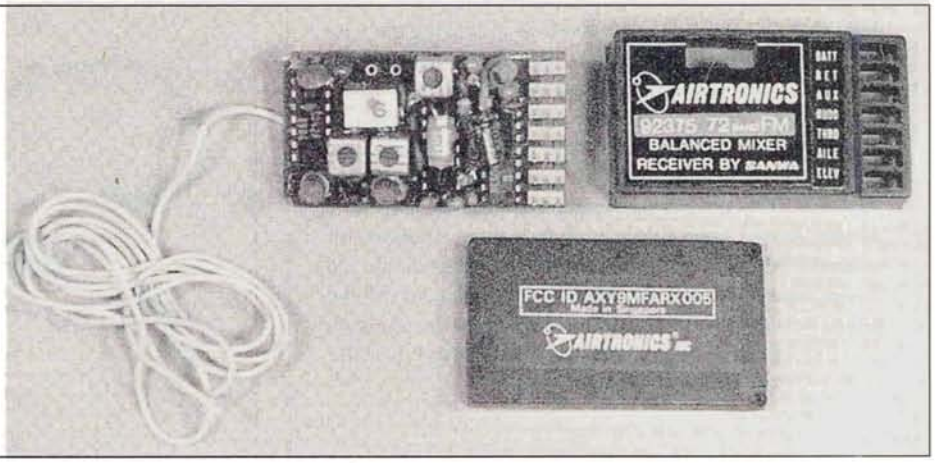
Stronger, faster servos—particularly the coreless type—draw more amperage. Servo leads also get longer so servos can be close to the surfaces they control. Long servo leads create greater voltage-line loss and are more likely to transmit electronic noise back to the receiver. One stalled servo can draw 1 amp (1,000mA). Two hard-working servos can do the same. Where does that leave the receiver if the system battery is less than 1,000mAh? Sounds like an accident about to happen, doesn't it? One solution is to add a more powerful battery pack to the system. That solves part of the problem, but doesn't do anything to prevent the biggest potential hazard: electronic "noise" that travels through those long servo wires and directly into the receiver.

The best solution is to insulate the receiver from the servo power lines by using a separate battery pack for the servos. This provides more protection from electronic "noise" than any other device (short of putting an optical coupler on each servo lead). Use the 500 to 700mAh pack that came with the system to power the receiver, as most receivers draw less than 25mA. Put the big power pack on the servos. A 6-volt pack will give the servos an average 20 percent increase in speed and torque. Use whichever capacity (Ah) battery pack that you want; a 2Ah (2,000mAh) pack, or one that's even higher, will provide good insurance, although battery cells get larger and heavier as their capacity goes up. (There's always a tradeoff!)

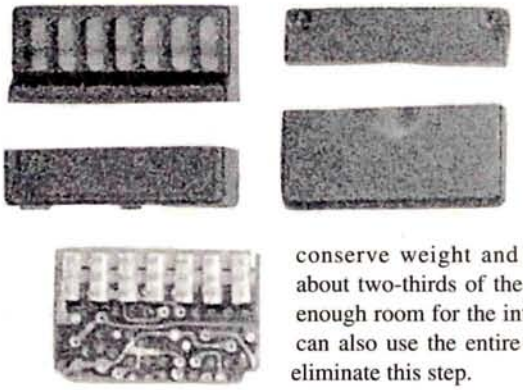
1 The wiring diagram for the servo power connector is quite simple. Just cut the positive side of the power lead from the servo to the receiver and connect it to the servo battery. Then make a common ground between the servo battery and the rest of the system. Look at the diagram again, and multiply the number of servos times three or four for a 6- or 8-channel system. Then add a switch and a charge jack for each battery. Now picture the whole thing with wires, instead of pencil lines, connecting everything. Several questions arise. Where do you terminate the positive leads coming out of the receiver? Where do you splice in the new positive leads from each of the servos to the servo battery? Where do you splice in the new common ground wire? Don't give up! The unit can be built without a single spliced wire and with virtually no additional wire. The unit is then plugged into the wiring between the receiver and the servos.



2 I started construction with old receiver parts from a pre-1991 non-gold-stickered receiver—worthless to most people, but invaluable for this project. If you don't have an old receiver, you can probably get one from another modeler. The PC boards in these old receivers are of high quality; the case is made to fit a certain brand of servo plugs; the pin connectors are gold-plated, and most of the required soldering has already been done.

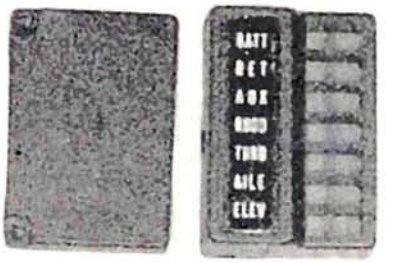


3 Here, I've "de-populated" the part of the board that I will use. After I had removed the components, I cleaned off the excess solder with a woven copper braid (wick), which is made for removing solder and is sold in all electronics stores. These braids work so well that they "suck" the solder completely out of the holes in the connector pads and leave a perfectly tinned pad ready for soldering. Look closely at the board, and you can see that all the center pins are connected to a buss. All of the pins on the right side are connected to a second buss; these are the positive and negative power connectors. This saved me from making 14 separate solder joints. Alongside each signal pin is a pad connected by a lan to the individual signal pins. That saved making another six solder joints, and the pads make it a snap to solder the new connections.

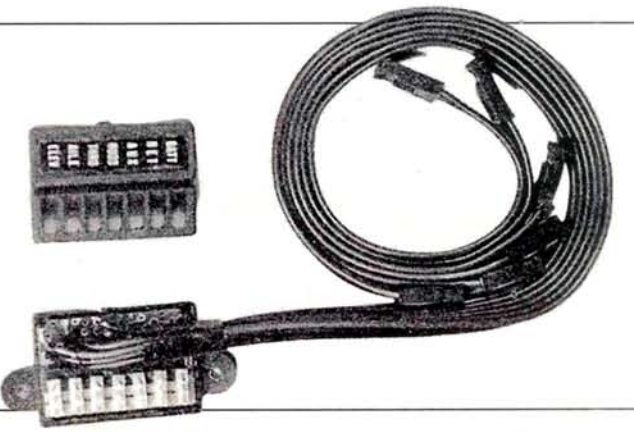


4 The picture shows the case, board and bottom cover cut to final size. To conserve weight and size, I cut away about two-thirds of the case, leaving just enough room for the internal wiring. You can also use the entire receiver case and eliminate this step.

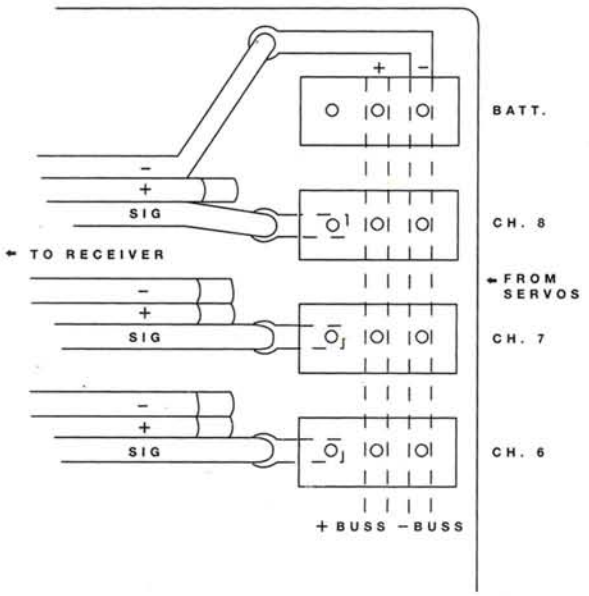
5 I glued the case parts together with thick CA. By removing the excess material from the center of the case, I retained the mounting lugs and screw posts on each end. The "new" case goes together as smoothly and tightly as the original. I carefully pried the label off the original case, cut it to size and reinstalled it on the new case.

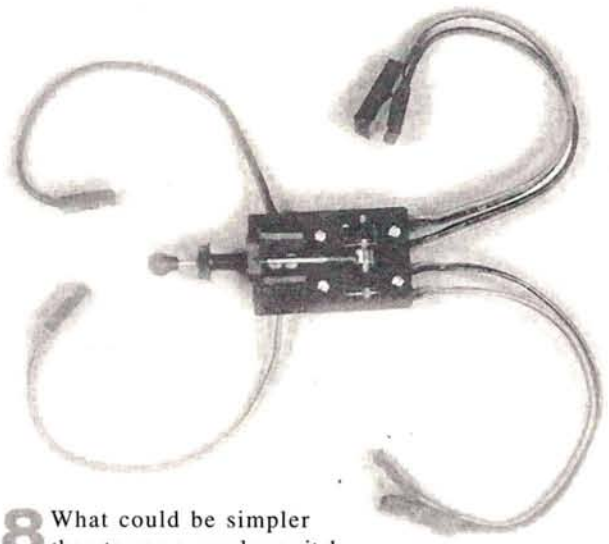


6 The leads, which are plugged into the receiver, are soldered into place. A piece of shrink-tube is used to bundle them together and provide some strain relief where they exit the case. Assembled leads with plugs and 12-inch pigtails are available from several aftermarket manufacturers. Most have gold-plated contacts, and some are available with heavier 22AWG wire for $2 to $3 each. I made the mounting tabs on the case from the scrap material I had removed earlier. They aren't absolutely necessary; you can also wrap the case in foam and anchor it in some fashion.



7 There's not much work involved in making the wire connections. Each lead has its signal conductor soldered to a pad alongside a signal pin. All of the leads—except one—have the positive and negative conductors capped off with shrink-tube. One lead has the negative conductor soldered to a pad that's connected to the negative buss. This provides a common ground for the whole system. (Note: some systems use the center connector for ground.) When the servo battery pack is plugged into the power connector, it is automatically connected to all the power connectors for the servos as well as the common ground. That's the whole thing—except for the switch/charge-jack installation.

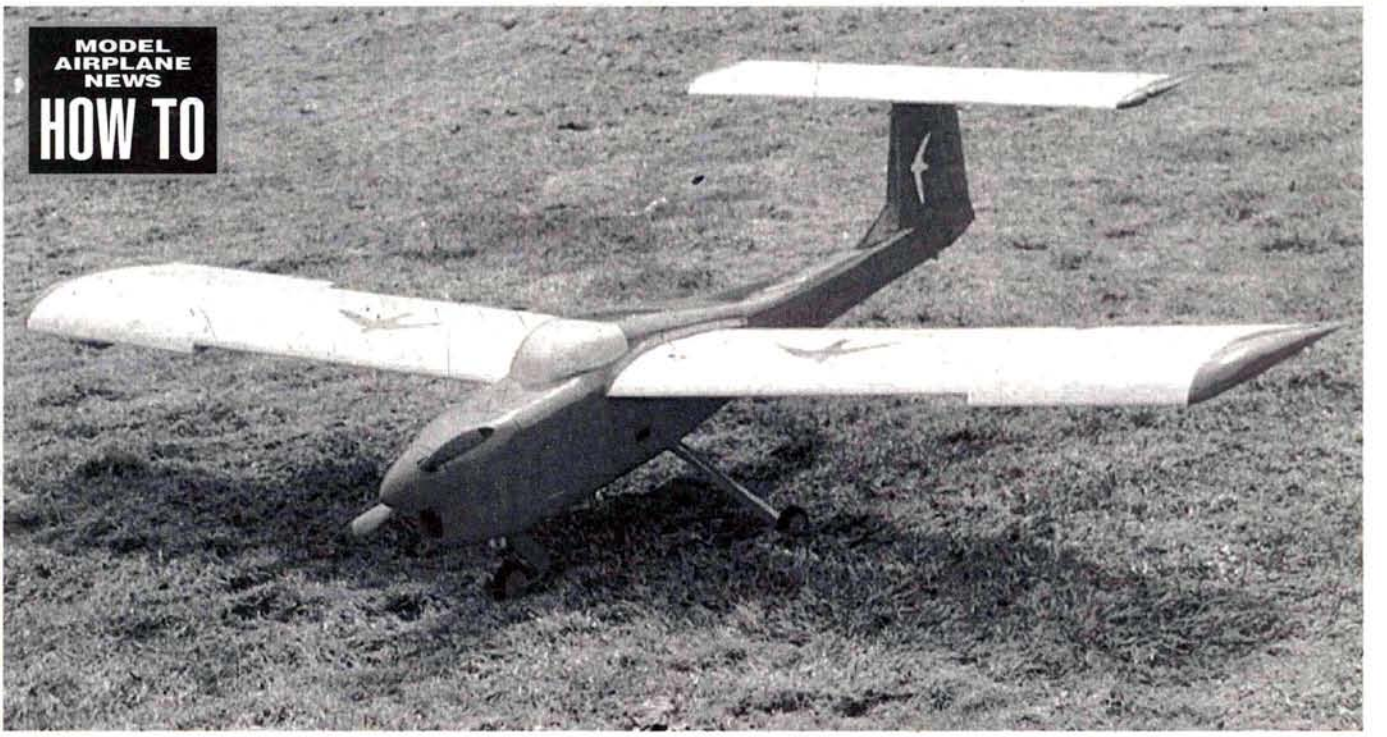




8 What could be simpler than to use a regular switch harness on each battery? A single switch to turn on/off both battery packs simultaneously, that's what. I have enough trouble with one switch, let alone trying to remember to turn on two before starting the engine and turn off two after landing the aircraft. So, I ganged the two switch harnesses by making a simple modification to a Du-Bro* quick-switch mount. I cut off the inner part where the switch would normally be mounted and replaced it with a piece of plastic that was cut out so that two switches could be mounted side by side. I drilled a hole just big enough for a short no. 2 pushrod wire through each switch lever. I used a threaded piece of 2-56 pushrod wire and a wheel collar to replace the push/pull wire and plastic cap that come with the switch mount. When the threaded pushrod is tightened down through the wheel collar, the short switch-lever wire is locked tightly into place. Now there's only *one* "switch" outside the airplane.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

MODEL AIRPLANE NEWS
HOW TO



The Swift at rest. It is "flutter-free."

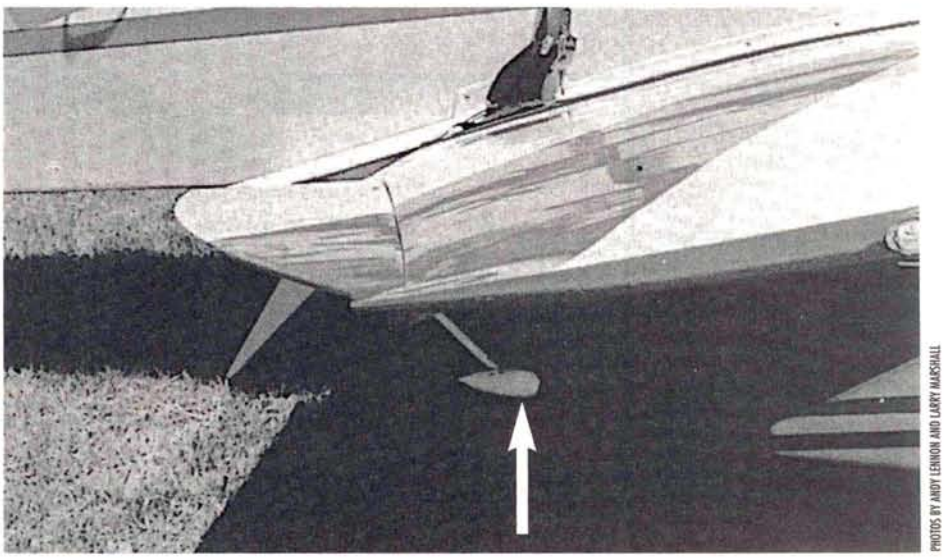
Prevent Control-Surface Flutter

An ounce of prevention

by ANDY LENNON

TODAY'S POWERFUL engines, higher-pitch propellers and good, low-drag designs with moderately higher wing loadings all combine to produce surprisingly high-speed flight.

The author's Swift, powered by an O.S.* Max .46SF engine and rotating an APC* 10x9 propeller, achieved 138mph in normal flight; in a vertical, power-on dive, this speed would have been exceeded. The potential for damaging control-surface flutter—and a probable crash—is considerable at these speeds.



PHOTOS BY ANDY LENNON AND LARRY MARSHALL

On this CAP 10, a more traditional, external weight was used.

Flutter is not a recent phenomenon; aeronautical engineers detected it and developed its prevention in the 1920s. They found that adding weight to the control surface (ahead of the hinges, so the CG of the combination moved forward to the hinge line) would prevent flutter. It is called "control-surface mass-balancing."

Weight- and cost-conscious full-scale designers add only sufficient weight to prevent flutter at slightly beyond the "never exceed" speeds of their designs. For model aircraft, full balancing to the hinge line is recommended. The author's Swift required two ounces of lead—just over 2 percent of its gross weight of 92 ounces—to mass-

balance ailerons, elevators and rudder. That is a very low price to pay for flutter prevention. High-lift devices do not require mass-balancing.

To explain the mechanics of flutter, refer to Figure 1: a typical elevator control-surface cross-section. Its hinges have little friction, permitting it to droop of its own weight. It is not connected to a servo. Now, imagine this unit suddenly being thrust into a high-speed airstream; say, out the open, passenger-side window of a fast car.

Air striking the elevator forces it up; its momentum carries it beyond neutral, where it is struck by the airflow above and is forced down again. Flutter then commences. Note that the violent oscillations are energized by the fast airflow.

The speed at which flutter will occur depends on many factors: hinge friction, weight and size of the control surface; location of its CG relative to the hinge line; and stiffness of the control linkage. When the speed is sufficient to excite the frequency of the oscillations, flutter can occur.

Figure 1. Typical control surface in high-speed airflow

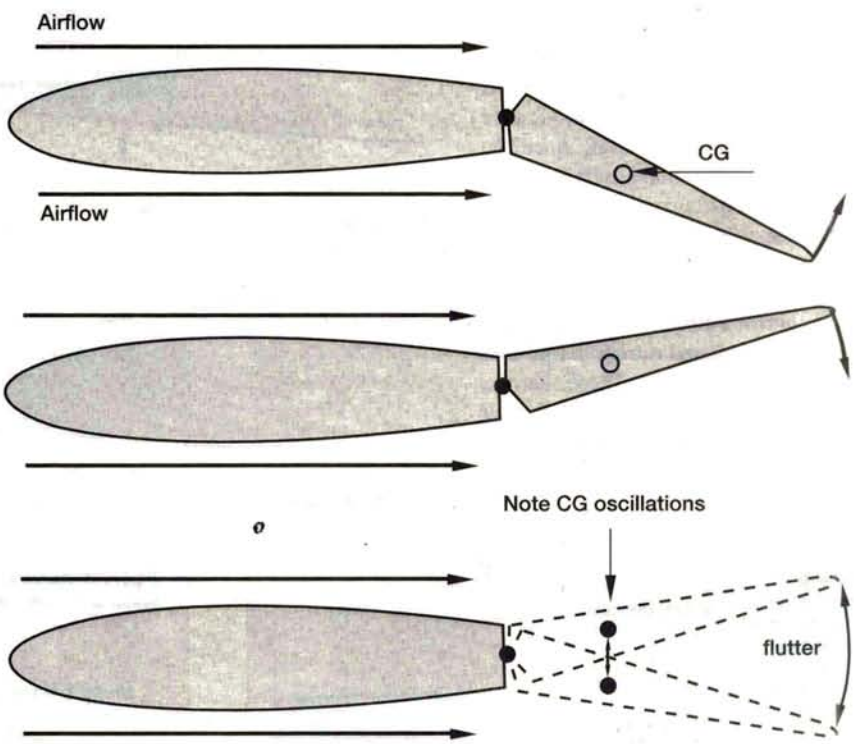


Figure 2. Mass-balanced control surface

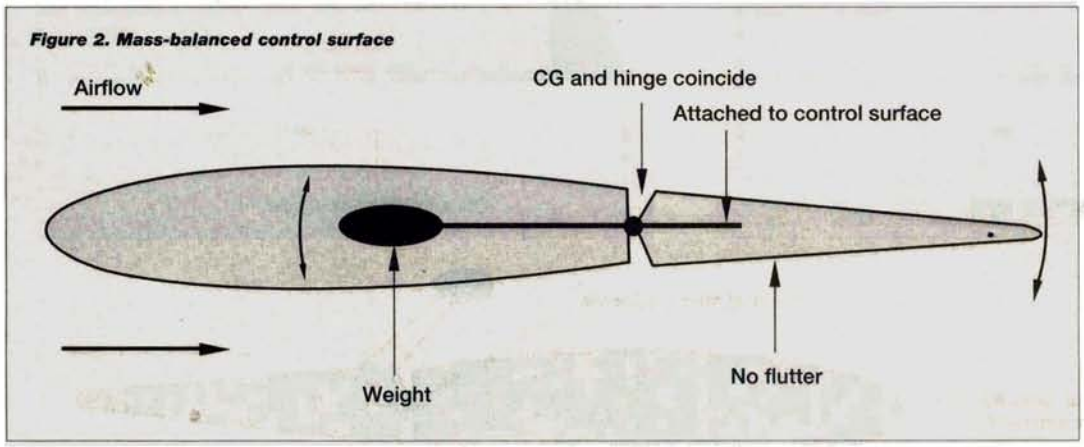
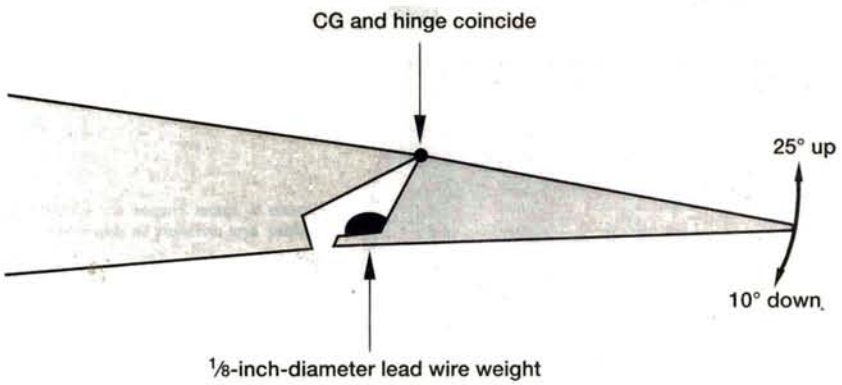


Figure 3. Aileron mass-balance (author's choice)



Refer to Figure 2. Here, the control surface is mass-balanced so that its CG and the hinge line coincide. There is simply no way the CG can oscillate; flutter is prevented. In Figure 1, the control surface was not linked to a servo. Linkage would reduce the potential for flutter but would not prevent it long-term. In time, the linkage will loosen; servos will flex slightly on their rubber grommets; holes in servo, control and bellcrank horns will enlarge; the model's structure will flex under high centrifugal loads during maneuvers. If not prevented, flutter will ultimately occur.

Two experiences bear out this contention. A good friend built a large flying boat of the author's design. After much flying, elevator flutter occurred, and only skillful piloting saved the model. Mass-balancing the elevators prevented this flutter, and subsequently, the flying boat

flew for many years until radio interference brought it down.

The second experience relates to this author's Snowy Owl, now 20 years old and still flying. The aileron linkage is now so loose that it permits ¼ inch of play on the aileron trailing edges, an ⅛ inch up and an ⅛ inch down—a sure invitation to flutter. However, since the ailerons were fully mass-balanced, no flutter has ever occurred. The model is certainly capable of speeds that would otherwise generate flutter.

Figures 3 to 10 illustrate means to mass-balance control surfaces. Most of these should be incorporated during design and construction of the model. Those that are external, such as Figures 4B and 7, may be added to existing models on any or all control surfaces. The version in Figure 4B was used on the flying boat.

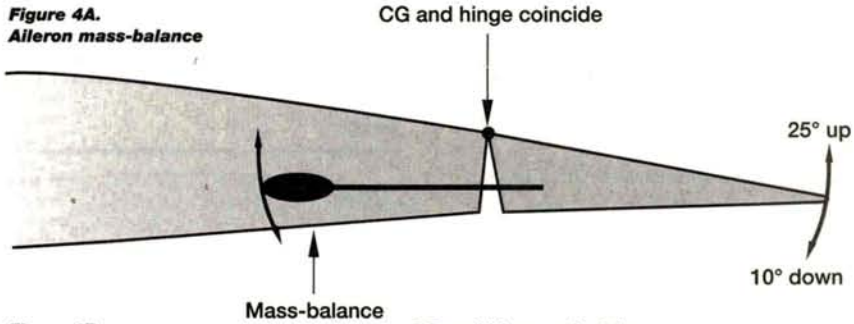


Figure 4A. Aileron mass-balance

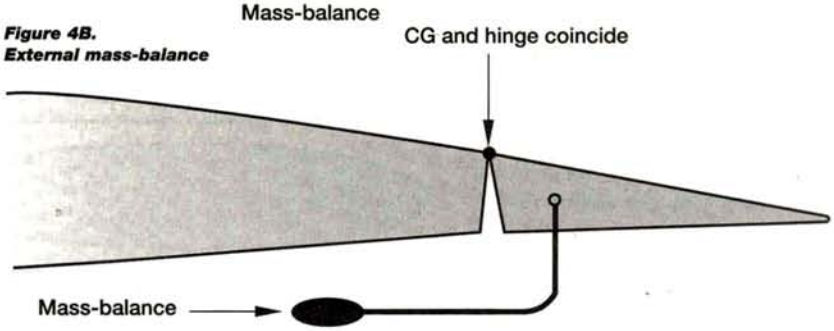


Figure 4B. External mass-balance

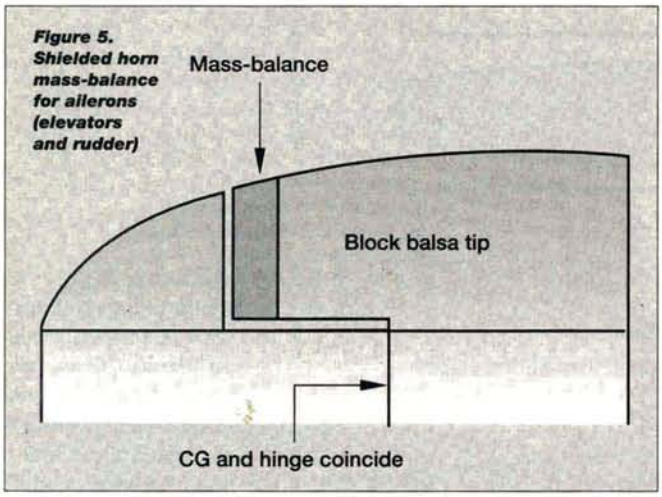


Figure 5. Shielded horn mass-balance for ailerons (elevators and rudder)

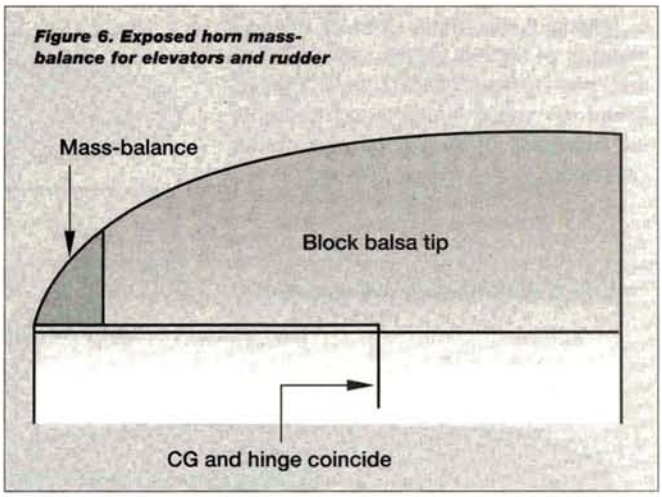


Figure 6. Exposed horn mass-balance for elevators and rudder

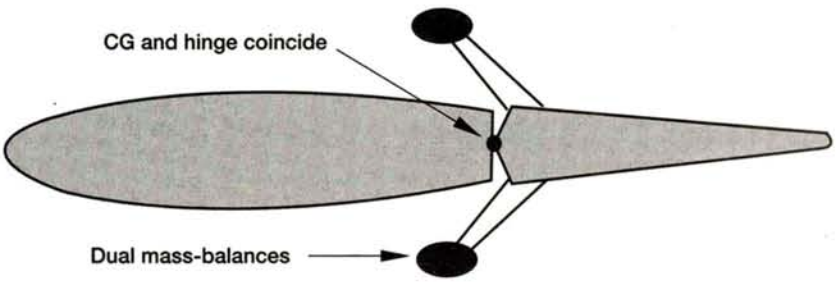


Figure 7. Exposed dual mass-balance for ailerons (elevators and rudder)

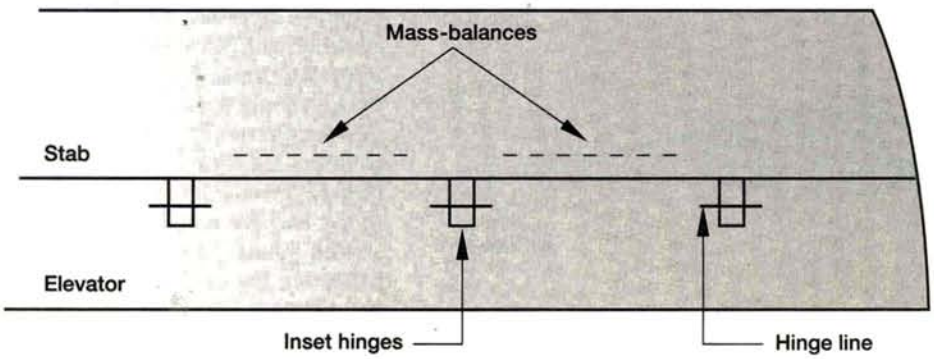


Figure 8. Inset hinges for elevator and rudder are difficult to gap-seal

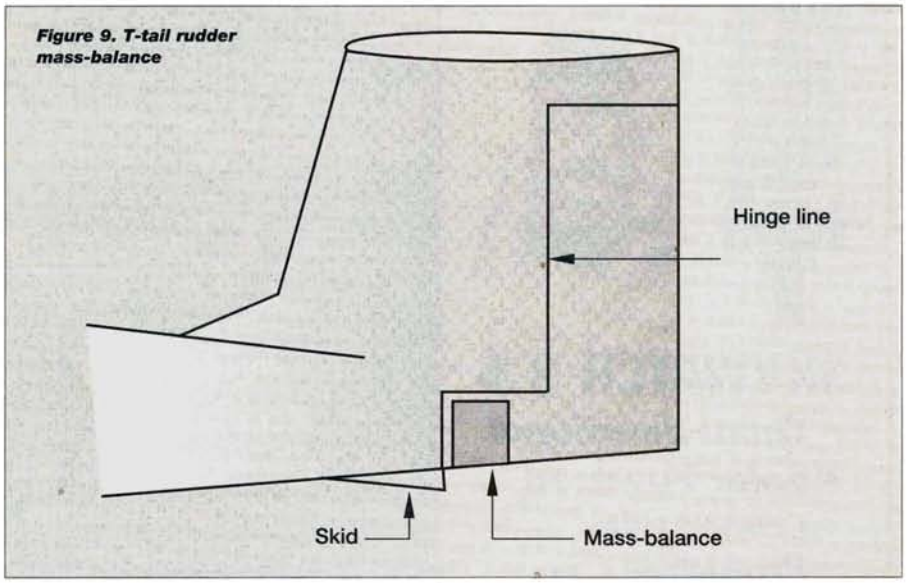


Figure 9. T-tail rudder mass-balance

One type of aileron, a strip aileron, is prone to outboard-end flutter if it is weak in torsion. Mass-balancing at the outboard ends will prevent flutter.

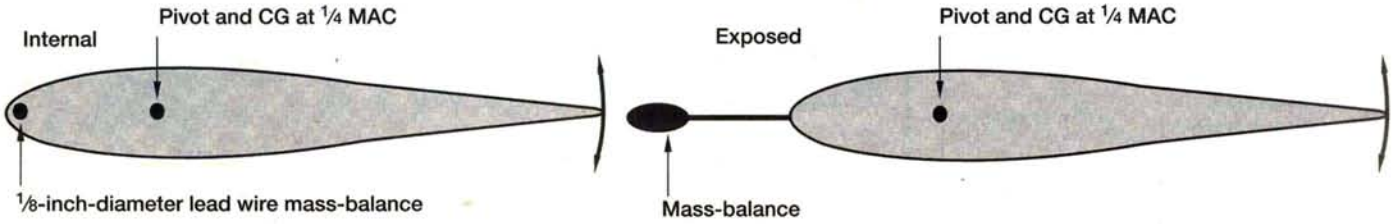
The full-scale shielded and exposed horns in Figures 5, 6 and 9 reduce the pilot's effort to operate these surfaces. This is not a consideration for model aircraft (servos have adequate torque), but they are scale-like and provide neat, concealed mass-balanced installation.

In conclusion, the only sure, long-term prevention of flutter is mass-balancing so that the CG is on the hinge line.

An ounce—or two—of prevention is worth a pound of cure.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

Figure 10. Stabilator mass-balancing



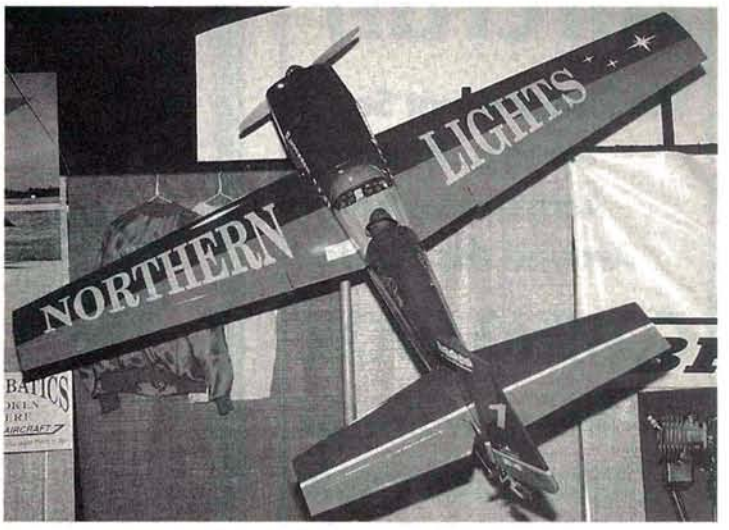
Thinking BIG

by GERRY YARRISH

IMAC MONOPLANES

IT DOESN'T TAKE a lot of effort to figure out that unlimited aerobatic monoplanes with names like Extra, Sukhoi and Giles are very popular these days. In scales from 25 to 40 percent, these sky dancers are indeed very impressive. Though biplanes like the Pitts Special and Christen Eagle are also very much a part of the aerobatic world, the monoplane is the weapon of choice when it comes to full-size world competition.

International Miniature Aerobatic Club (IMAC) competition has had a lot to do with the growth in popularity of these scale and semi-scale models, but it's also the performance and flight characteristics of these aircraft that make them so appealing. I've had several opportunities to fly some of these big, impressive models, and I have to admit that many of them are on my "to build" list. Here's a short list of what's available.

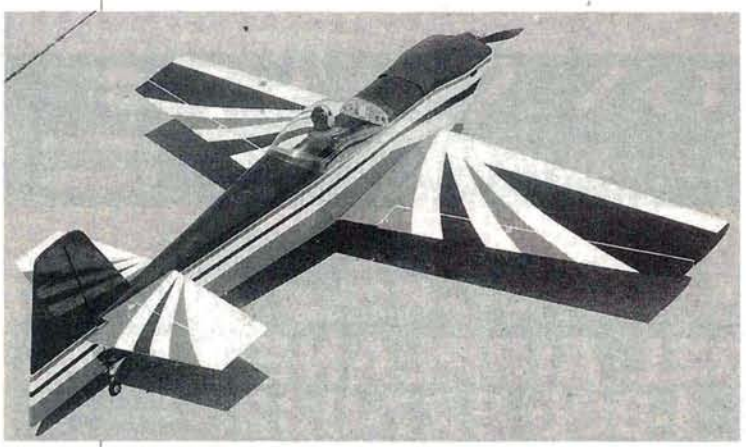


Done up in attractive Northern Lights colors, the Carden Aircraft Extra 300S is a very popular model. It's available in several sizes.

Also from Carden Aircraft is its new CAP 232 that's available in 30-, 35- and 40-percent scale.

BIG KITS

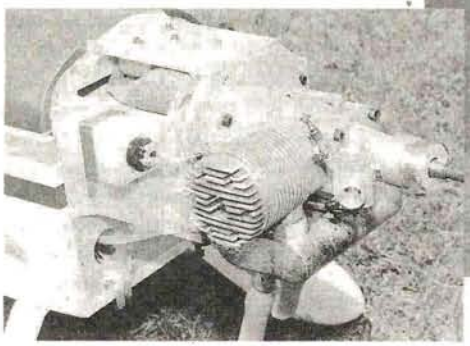
• **Carden Aircraft*** was one of the first companies to offer the now very popular Extra 300. Dennis Gergits offers the 300 in 26-, 30- and 35-percent scales. The most popular, I am sure, is the 35-percent giant coupled to a hot 3W* 80 gas burner. When it comes to color schemes, there are more than you can imagine. The most obvious choice would be Patty Wagstaff's white and blue version; several graphics companies offer Patty's aircraft markings in decal sets. I like the stuff offered by Model Graphics*. As for me, I'd have to choose the colors of the Canadian aerobatic team "The Northern Lights," but that's what is so great about modeling: variety. Dennis also has a Giles 202 and a CAP 232 in his lineup, both available in different sizes. I saw the 41-percent Giles perform and, to say the least, I was impressed. If you were at this year's Joe Nall giant scale fly in, you know what I'm talking about.

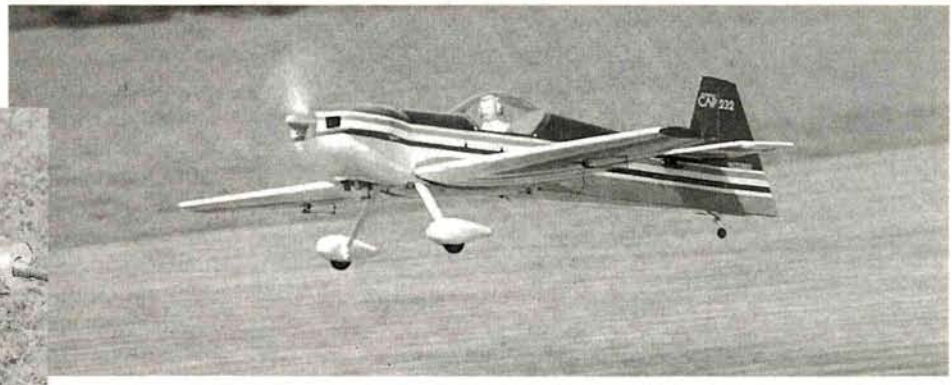


New from Hangar 9 is this 73-inch-span CAP 232 ARF. Add a Saito 1.50 and watch out!

• **Lanier RC*** is also a well-established source for big, unlimited aircraft including the Extra 300, Giles 202, CAP 232, Laser 200 and the soon to be released 31.5-percent Staudacher 300. Bubba Spivey seems to have a knack for coming out with just the right airplane at just the right time to satisfy the needs of R/C modelers. Known for its wood, foam and plastic approach to model building, Lanier has switched (for its last couple of designs, anyway), to all-wood designs. These new kits make good use of laser

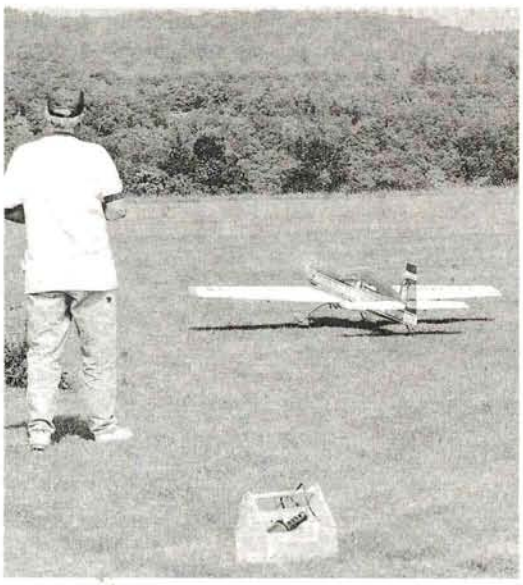
The Midwest CAP 232 (right) is a very attractive aerobat. The popular power choice for it is the Moki 1.8 glow engine (below).





cutting and CNC routing to produce strong, lightweight aircraft that are relatively quick to build. And naturally, they all fly great!

• **Hangar 9*** has just come out with a custom-built CAP 232 ARF as part of its new Ultra series of aircraft. Rendered in an attractive (IMAA-legal) 1/4 scale, the CAP 232 has a wingspan of 73 inches and a wing area of about 1,030 square inches. This makes it a not-too-big, big bird. The model comes covered with Goldberg* Ultracote and equipped with Sullivan* hardware. I just love 6-foot-span, 1.20 4-stroke powered models, and I think this model is going to be very popular. I have been told that powered with a Saito* 1.50, the model is capable of hovering and torque rolls at just under 3/4 throttle; enough said!



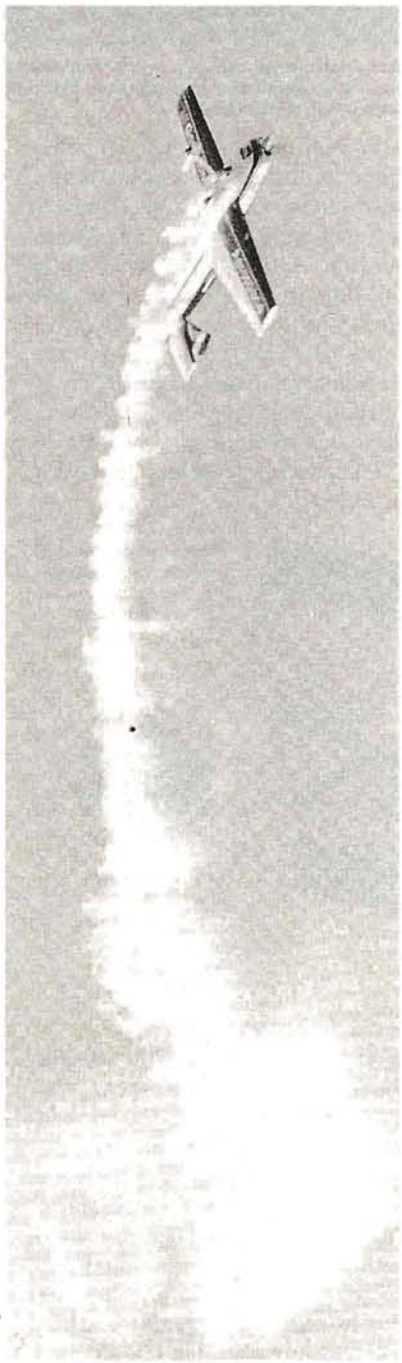
Flying buddy Jim Onorato prepares to commit aviation with his big Lanier Extra 300S. Jim powers his Extra with a Brison 4.2ci gasoline engine.

• **Midwest Products***. Midwest has several beautiful kits that are specially aimed at the Aresti sequence, including its 80-inch version of the CAP 232. Powered by the very popular Moki* 1.8 glow engine and with typical Midwest wood construction, the Midwest CAP has impressive performance. Other IMAC-legal aircraft in the Midwest lineup are the Extra 300S, Giles 202 and Super Stinker Pitts Special bipe.

There are many other kits around for big, unlimited monoplanes, but I can't begin to cover them all in a single column. I've mentioned the ones I have personal experience with; I guess we'll have to talk more about them another time. For more IMAC info, check out Dan Wolanski's article, "Why is IMAC so Hot?" in the September 1998 issue. If you do want to fly one of these beauties, you'll learn that the most difficult part is picking which kit to build.

STAUDACHER PLANS

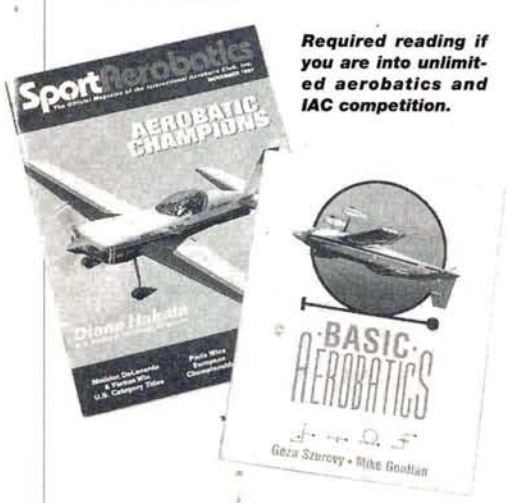
Shortly after I started "Thinking Big," Bruce Lund sent me a set of his Staudacher 300D plans. Bruce Lund Models* plans are very well done and, as the photo shows, can be used to build a very attractive model. The 300D is of all-wood construction and the model has a wingspan of 80 5/8 inches. Along with the plans, you get a set



Smoke on! Jim Onorato adds a smoky signature to his Lanier Extra 300's flight routine.

Bruce Lund poses with his new Staudacher 300D. Bruce offers plans, cowl, pants and landing gear, and a kit is available from All-American Kit Cutters.

of instructions and several photocopied pictures to help with the construction. Landing gear, wheel pants and engine cowl are available from Bruce Lund Models, and a kit is available from All-American Kit Cutters* for those who don't want to scratch-build. The canopy is from the Carl Goldberg Models Extra 300 kit. If you think there are too many Extra 300s in the world, why not send Bruce $37.50 and make your next aerobat a Staudacher?



Required reading if you are into unlimited aerobatics and IAC competition.

READING ABOUT IT

One of the attractions of IMAC models is their scale appearance. IMAC aircraft are flown in a scale fashion, and learning as much as you can about the full-size aircraft helps you to fly better as a model pilot. It's also a lot of fun to do the research and find documentation when contemplating a new project. Two sources for this information are *Sport Aerobatics* magazine and the book, "Basic Aerobatics," coauthored by Geza Szurovy and Mike Goulian.

Sport Aerobatics is one of several magazines published monthly by the Experimental Aircraft Association* (EAA), and it is full of articles and information dealing with the full-size International Aerobatic Club (IAC) competition. You'll find colorful articles about the aircraft and their pilots, as well as the current standings in the world aerobatic championships. If you like IMAC, you just gotta read *Sport Aerobatics*.

"Basic Aerobatics" is a great reference guide for full-size maneuvers, and it is an excellent guide for improving aerobatic flight maneuvers. Besides having many photos and descriptions of full-size aerobatic aircraft, the book includes a complete list and explanation of aerobatic maneuvers and Aresti figures. Available from TAB Books division of McGraw-Hill, this book is a worthy addition to any aviation library.

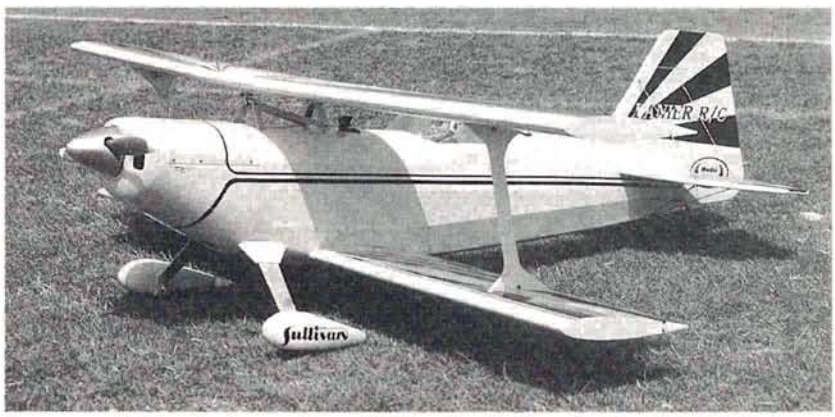
CHEETAH POWER

A relatively new powerplant for big birds is the Cheetah 42DX from Reid Quality Model Products*. The Cheetah 42DX is a lightweight version of the 2.5ci Cheetah 42, and it can spin an 18x10 prop at 6,500 rpm. The 42DX comes standard with the Syncro-Spark ignition module built right into the case. There is no mechanical spark advance linkage required, and the CH ignition system is microprocessor-controlled and requires no maintenance. The engine comes with a large muffler, adjustable velocity stack and throttle linkage and a 2-year limited warranty. Not too bad for an engine priced under $400.

The Cheetah 42DX gas engine, new from Reid Quality Model Products.

Well, we're again at the end of another column. I'd like to encourage readers to send me questions and comments so I can steer this column in the direction you'd like to see. My email address is gerryy@airage.com. See ya!

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*



Yes, we are talking about monoplanes, but I just had to throw in this shot of Lanier's new Ultimate Pitts Special. I'm working on one and will be powering it with an O.S. 1.20 4-stroke. Span is 60 inches.

Current THOUGHTS

by TIM McDONOUGH

ELECTRONIC SPEED CONTROLS

IN THE EARLY days of electric-powered R/C aircraft, the electric motor typically had two speeds: on and off. The on/off control was most commonly implemented by using a standard R/C servo and a switch. When the servo turned in one direction, the switch was moved to the "on" position. Moving the servo the opposite way would turn the switch—and the motor—"off." In most cases, this meant that the pilot had the choice of either climbing or gliding.

This simple on/off control was certainly more desirable than letting the motor run at full speed until the battery pack was exhausted. However, it imposed limits on the kinds of maneuvers that could be flown and, in most cases, made scale-like flight difficult, if not impossible.

With the advent of the electronic speed control (ESC), electric flyers finally had fully proportional control of their electric motor speed. In the years since the advent of the ESC, we've come to take this essential component for granted. But just how does this little electronic wonder do its job, and are there things you should know about its care and feeding?

The specifics of how a DC motor works are beyond the scope of this article. Without going into a lot of detail, I'll just say that the speed of any particular DC motor is dependent on the voltage applied to the armature. Raise the voltage, and the motor turns faster. Lower the voltage, and it slows down. Remove the voltage altogether; it stops.

Ideally, then, the ESC would serve as a sort of valve that allowed you to control the amount of voltage applied to the motor. The trouble with building this ideal ESC is that regulating the motor voltage in a fully proportional manner is more difficult to do efficiently and economically than simply turning the motor voltage on and off.

The modern ESC is a compromise between the ideal ESC and the simplicity of an on/off control. By using a technique called pulse-width modulation (PWM) and relying on the momentum of the motor as it turns, the ESC controls the motor speed by changing the *average* voltage applied to the motor. The key to understanding all this is in seeing just what PWM does.

PWM divides up some increment of time (called the "base period") into a given number of even steps, or increments, much as a minute is divided into 60 seconds. During each of these increments, the thing being controlled by the PWM—our motor voltage, for instance—is either on or off. The average voltage out of the control is a ratio of the "on time"–or how wide the "on" signal, or pulse, lasts–and the length of the total PWM interval. An example will make this clearer.

To make the math easy, let's assume the base period of the PWM signal is 10 seconds long. Also assume that the battery pack provides 20 volts. It's easy to see that if we never turn the voltage on, the motor will not run, and if we always have it on, the motor will run at full speed. But what if we turn on the voltage only for the first 5 seconds of each 10-second period? Half of the time, the full voltage would be applied; the other half, no voltage

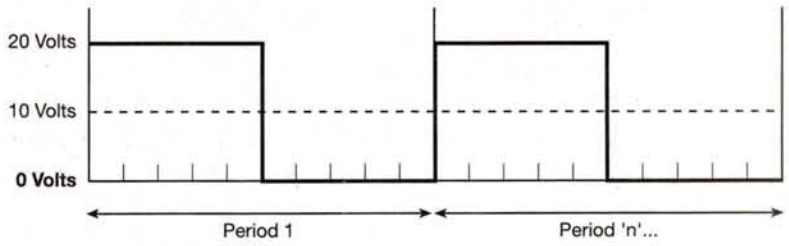
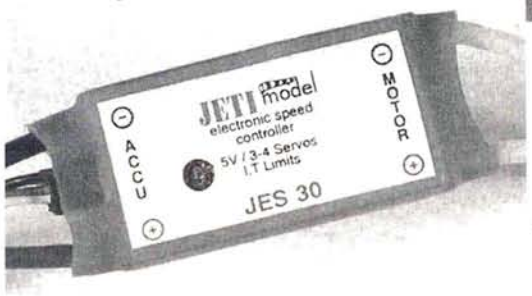


Figure 1. Half-throttle PWM signal

would be applied. The average voltage would be (5÷10) x 20 = 10 volts. Similarly, if the voltage is turned on for the first 7 seconds out of each 10, the average voltage is (7÷10) x 20 = 14 volts. Figure 1 illustrates PWM voltage control.

Given my example, you can see that this mythical ESC could supply an average voltage to the motor in increments of 10 percent from 0 to 20 volts. You are probably thinking that if the motor is turned on for 5 seconds and then left off for the next 5, it will have more than enough time to stop turning before the next PWM cycle starts, when the battery voltage is again applied. If you also thought that the motor would run at full speed for those first 5 seconds, you would be correct once again.

The key to successfully using PWM to control our motors is in the careful choice of the length of the base PWM period and the number of discrete steps between off and full speed. We humans often think of time in terms of seconds, minutes and hours. The microprocessors used in most modern ESC designs can easily deal with time increments of 1/1,000 second and less.



The base period needs to be short enough for the rotating mass of the motor to prevent it from making noticeable starts and stops at low throttle settings. A base period that is too long can contribute to a condition called "cogging." This problem is particularly noticeable on geared systems. In severe cases at the lowest throttle settings and high gear ratios, you can actually see the prop turn in one step at a time instead of rotating smoothly! This can be very hard on gears and belts and can cause premature failure.

The more individual steps the PWM provides, the closer the output will be to our ideal control. In practice, however, there need only be as many individual steps in the PWM signal as you need to satisfy the pilot that he has smooth control of the motor. A typical modern ESC starts a new PWM cycle 2,500 times a second and provides 40 or 50 individual steps.

Aside from satisfying your curiosity, a general understand-

BECs ... WHAT ARE THEY?

"BEC" stands for battery eliminator circuit. Huh? How can you possibly eliminate the battery from an electric-powered airplane?

The battery referred to in "BEC" is the receiver battery that powers your receiver and servos, not the motor battery. There is considerable debate on whether BEC is desirable. Among electric flyers, the BEC issue is often as hotly debated as the topic of downwind turns. For now, I'll stick with a brief summary of how BEC works with your ESC.

The first component of the BEC is a device called a voltage regulator. Inside the ESC, the battery-pack voltage is connected to the input of this regulator. The regulator converts the battery voltage—say, 8.4 volts for a 7-cell pack—to the 4.8 volts required for your receiver and servos. This eliminates the need for a separate receiver pack, and this conserves both space and weight inside the airplane. There are limits to how large a pack can be used for BEC operation; typically, this is 10 cells.

The 10-cell limit has to do with how the regulator does its job. Since the amount of electrical current required for your servos and receiver must pass through the regulator and the regulator must remove or "drop" the excess voltage (above the 4.8 volts we need), the excess power is dissipated as heat. If only a few volts are dropped, the heat is minimal. As you increase the pack size, the regulator must drop more and more voltage; this generates more and more heat. At some point, the regulator shuts down due to the excess heat and shuts off your receiver and servos in the process. This is generally a bad thing.

Fortunately, high-cell-count packs usually mean larger, more powerful airplanes. In these planes, space isn't usually at a premium, and the few ounces of a receiver pack probably won't be noticed.

The second component of an airplane ESC is in the microprocessor software. When the ESC senses the battery voltage is getting low, it shuts off the motor with enough battery power in reserve to make a controlled deadstick landing.

ing of how the ESC works can help you protect your investment in it and, perhaps, in the motor. I've heard several people mention using their radio system's servo-limit, or "ATV," features to limit the motor current they measure to the motor or ESC manufacturer's specified maximum. There's a fallacy here that can get you in trouble fast.

Let's say that before any adjustments are made to the radio's limit settings, you measure the full power current in your system at 45 amps. Your ESC and motor are only rated for 30 amps, so you simply program the radio system to limit the "throttle" range so that your current reading is now only the recommended 30 amps. Fantastic. Without having to change the cell count of your battery or put on a smaller prop, your plane is now within the recommended limits—or is it?

Remember a couple of paragraphs back when you read how the motor receives an average voltage from the ESC? Well, guess what? By adjusting the trim settings, or limits, you've only lowered the average voltage in the system, as well as the average current. During the time the PWM has the system "on," you're still sending the full 45 amps of current through your 30A system.

Remember, the ESC is a control that helps to make flying your model more enjoyable. Don't try to use it to avoid the need for making other important system adjustments. Modern ESCs are very reliable when used properly. Barring crash damage, a properly used speed control will last a long time. It will provide the same performance five years from now as it did the day you bought it.

Keep in mind that I've covered only the very basics here, and modern ESC designs also incorporate features to help make motor operation safer. Other features, such as isolating the receiver from motor noise, providing "soft start" operation, receiver battery eliminator circuits (BEC), braking for folding props, etc., are all common, useful functions.

About the author

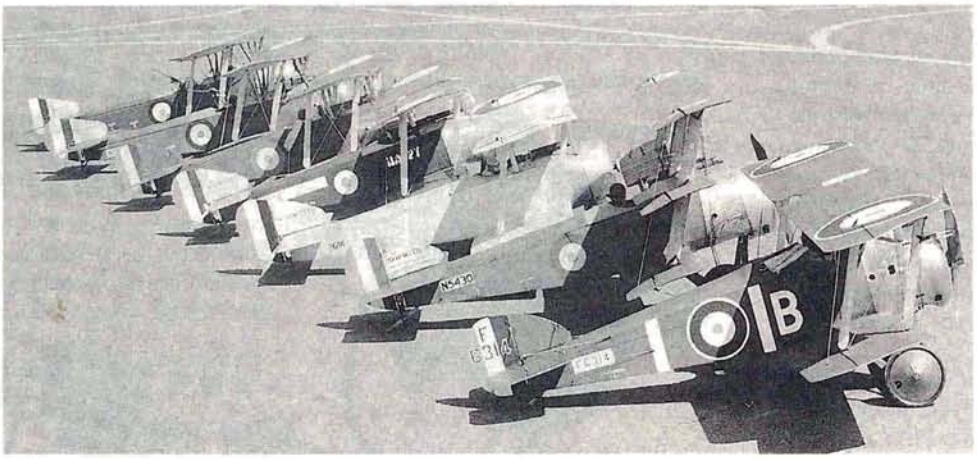
Tim McDonough is a software engineer for a contract electronics manufacturer in the Midwest. He has been flying and designing R/C aircraft for about 11 years and has flown electric-powered planes for the past four years. He may be reached via email at tpm@inw.net.

by BOB UNDERWOOD

THE WORLD CHAMPS

Max Merckenschlager's giant-scale Brewster Buffalo (photo by Stan Alexander).

THE 1998 SCALE WORLD Championships was held on April 26 to May 2, 1998, in Pretoria, South Africa, and featured F4B (control line) and F4C (R/C). Pretoria is one of the two capital cities of South Africa, nestled in a valley at just under 5,000 feet above sea level. Some 30-plus miles north of Johannesburg and two hours flying time north of Cape Town, Pretoria has a beauty that belies the social strains and tensions the country has felt over the years.



The day of nothing but biplanes in FAI is waning, but not gone! WW I lives!

The event was held at AFB Swartzkof, the first air force base in South Africa. Although some helicopter operations and training still occur there, it's primarily used now as an air museum.

The World Championships is a most ambitious undertaking. Considering there are only about 1,200 members in the entire South African modeling community, much credit must be given to the hosts. The logistics of the event, as well as the housing and social events, were very nicely choreographed.

For those of you who have never attended the World Championships, some form of explanation is required. Unlike Top Gun, Scale Masters, or the Nationals, where multiple flightlines produce a scene similar to O'Hare on a busy day, the World Championships is spread over an entire week. The models are flown one at a time in front of the judges. For the F4C competition, this results in an inability to complete one round in a day! Additionally, all flights are presented in front of the same panel of five judges. The high and low scores, by maneuver, are dropped.

Because F4C flying and static competitions are going on at the same time, it is possible that you might fly one or more rounds *before* your model is static judged. The rules provide that any damage that might occur will be overlooked, but I wonder how realistic this rule actually is. Due to the slower static judging this year, some models made two flights before static. In theory, you could turn in two good flight scores, have a serious crash just before landing on the second round and never be in a position to receive an easily or fairly determined static score. This anomaly will be addressed by the FAI scale subcommittee.

Andreas Luthi of Switzerland fielded this incredible Avro that finished second in F4C.

THE COMPETITION

How do the models at a World Championships compare to those at other major events? Interestingly, the range from medi-ocre to excellent is probably greater at a World Championships. This is due to the expense of competing internationally, and the fact that

The U.S. teams and their supporters (kneeling left to right): Ashby, Frederick, Torres, Kretz, Burnstine and Sheets. The man on the left in the brown hat is Leroy Weber, the founding father of FAI Scale.

often, the best modelers from smaller nations that are new to FAI are not yet able to field experienced teams. At the other end of the spectrum, the top models are scratch-built, exquisite works of art that are flown to perfection. The Avro flown by Andreas Luthi of Switzerland and Pavel Fencil's Knoller are classic examples of this. Max Merkenschlager's large Brewster Buffalo is another. Attention to detail and the pilots' abilities to perfectly place and execute each maneuver were obvious. How would some of these models and pilots fare at, say, Top Gun? Perhaps we'll find out next year!

Two sets of awards are presented by FAI at the Championships: individual medals through third place and team awards for countries. A team of three modelers may be entered in both F4C and F4B. This year, the U.S. F4C team of Wayne Frederick, Al Kretz and Ray Torres and the F4B team of Steve Ashby, Ralph Burnstine and Jack Sheets were guided by team manager Darlene Frederick.

As for the event itself, I cannot begin to describe the feeling generated by the coming together of many nations! Language barriers tend to fade; new friendships are made; old ones are rekindled. This year, the Championships was blessed with unbelievably beautiful weather: morning temperatures in the 60s and afternoons in the high 70s or low 80s. The wind was light but variable (less than 10mph), and the cloudless sky was a deep blue. Of course, South Africa was experiencing late fall at the time.

THE WINNERS

The highest finishers for the U.S. were Ray Torres, fifth in F4C, and Steve Ashby, sixth in F4B. The U.S. F4C team finished in eighth place overall. The F4B team finished in second place. It should be noted, however, that in F4B, only two full three-man teams were fielded. This is due to two factors: first, the cost of competition this year was considerable. Even with the special excursion fares offered by South African Airways, the cost of our airfare alone was in the vicinity of $1,300!

The second concern with F4B involves declining interest (with the exception of Eastern European countries). At present, there is a question whether we will continue to see F4B offered every two years. New rules within the CIAM (the aeromodeling branch of FAI) are directed at increasing the number of teams required to hold a world championships above the present five. This year saw the fulfillment of the five-team requirement at the eleventh hour! It seems safe to say that in the year 2000, when the Championships will be held in Interlaken, Switzerland, F4B will continue to live.

JUDGING

The panels of judges are composed of individuals from different countries. In F4C, there are five flight and three static judges. This year, Stan Alexander of the U.S. was the chief flight judge.

The judges are carefully evaluated through the use of the computer-based scoring. One primary concern, beyond that of consistency, is whether there is any evidence of national bias. The chairman of the scale subcommittee, Narve Jensen, watches the scoring very carefully and spends much time following the event doing an exhaustive analysis. This helps guide the organizers of the next Championships as they select from the pool of judges provided by each country.

Andreas Luthi's first-place giant-scale Bucker Jungmeister (photo by Stan Alexander).

At each World Championships, a panel of three individuals is given the task of being the jury. The panel's primary responsibility is to resolve any protests; however, the members also observe the event and provide guidance to the organizers. The jury in South Africa was composed of Dave Armitage (South Africa), Narve Jensen (Norway) and Bob Underwood (U.S.).

I realize that this report is very different from a standard contest report. I have tried to provide some background on FAI competition. For the last two years, scale subcommittee chairman Narve Jensen has attended Top Gun, in 1996 as an observer and in 1997 as a flight judge. He also served as a flight judge at the 1997 Scale Masters. Mr. Jensen sincerely believes that we can make changes within the scale world to bring about a coming together of rules. The recent dramatic changes in FAI rules (including increasing the weight limit to 10kg) is evidence of this fact. There is more to come!

WORLD CHAMPIONSHIPS 2000

I encourage all modelers to investigate the world of FAI scale. It stresses the concept of the complete modeler; you must be an excellent builder and flyer to win. Remember, in true Olympic style, there are only three individuals or teams who mount the winners' platform, but a finish in the top 10 is always a great accomplishment. Longtime FAI competitor Bob Wischer, who passed away last year, once told me that to win at a World Championships, you needed a static score in the top five or 10 and a flight score that matched the static. He was right!

So, where will you be competing in 2000? The AMA and the U.S. will select teams to attend the Championships in Interlaken, Switzerland, in August '99. Knowing the Swiss, they will present a well-organized event. They will also offer Giant Scale as an unofficial event. There are indications that the next World Championships will be very well attended. Make your plans now to try for the teams during the summer of 1999 or to attend as a supporter. The banquet alone should prove to be breathtaking, since plans are to hold it at a restaurant at the summit of the Jungfrau—11,300 feet above sea level. Contact our team selection chairman, John Guenther, or Teresa McKee at AMA headquarters, to be placed on the information list.

LATEST PRODUCT RELEASES

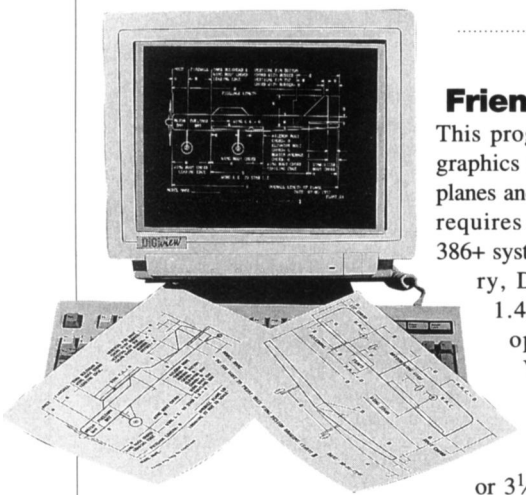
TOP FLITE

Gold Edition DC-3

This reworked kit features interlocking frame pieces and precision-formed ABS parts, and it comes with wire landing gear; it will also accept the semi-scale retracts designed specially for it by Robart. Specifications: wingspan—82.5 inches; wing area—750 square inches; weight—8 to 10 pounds; length—55.5 inches; engines required—two .25 to .40 2-strokes or two .40 to .52 4-strokes; radio required—4- to 8-channel with six to nine servos (two micro).

Part nos.—TOPA0500 (DC-3), TOPAQ8276 (retracts); **prices**—$349.95, $159.95.

Top Flite; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; website www.top-flite.com.



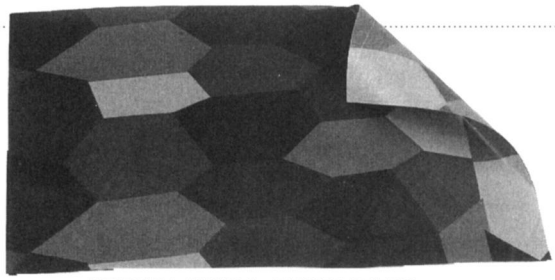
RCPLANE2

Friendly Designer

This program prints data and graphics for building R/C airplanes and analyzing designs. It requires an IBM-compatible 386+ system with 356K memory, DOS 5.0+, a 1.2- or 1.44MB floppy drive, optional hard drive, VGA or SVGA monitor and a graphics-capable printer. Specify 5¼-inch HD or 3½-inch disc with your order (discs are not returnable because they are not copy protected).

Price—$39.95.

RCPLANE2, c/o Joe Capitanio, P.O. Box 272, Lumberton, NJ 08048.

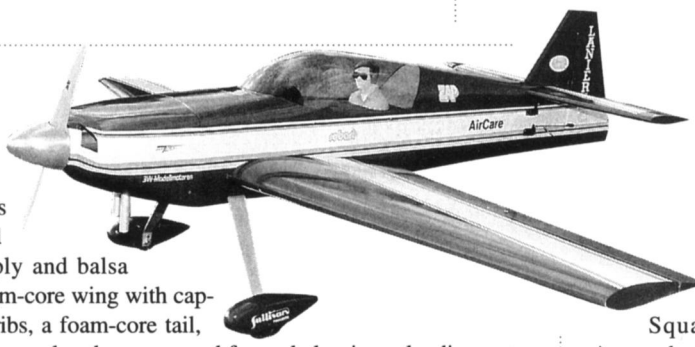


ARIZONA MODEL AIRCRAFTERS

Iron-On WW I Camouflage

Available in 1/3, 1/4 and 1/6 scale, this five-color WW I German/Austrian covering comes in upper and lower wing patterns. Arizona Model Aircrafters also offers custom acrylic paint sets that specifically match the Methuen color handbook.

Arizona Model Aircrafters, 14795 N. 78th Way, Unit #800, Scottsdale, AZ 85260; phone/fax (602) 348-3733.



LANIER RC

35% GILES 202

This kit includes all laser-cut and CNC-routed lite-ply and balsa parts, a plug-in foam-core wing with capstrips to simulate ribs, a foam-core tail, plastic wheel pants, cowl and canopy, and formed aluminum landing gear. The model's outline is scale; however, to improve flight characteristics, the stabilizer area was increased and the airfoil was changed. Specifications: wingspan—92.4 inches; wing area—1,338 square inches; length—82 inches; weight—20 to 24 pounds; engine required—3.2 to 5ci.

Lanier RC, P.O. Box 458, Oakwood, GA 30566; (770) 532-6401; fax (770) 532-2163.

SQUADRON PUBLICATIONS

Hurricane Walk Around

Squadron Publications adds to its Walk Around series with this new volume on the Hurricane. In the minds of most modelers, the Hurricane has taken a back seat to the Spitfire, but it was used far more and makes a beautiful model. This volume should be welcomed by modelers hunting for detailed information on this old bird.

Price—$14.95.

Squadron Publications, 1115 Crowley Dr., Carrolton, TX 75011.

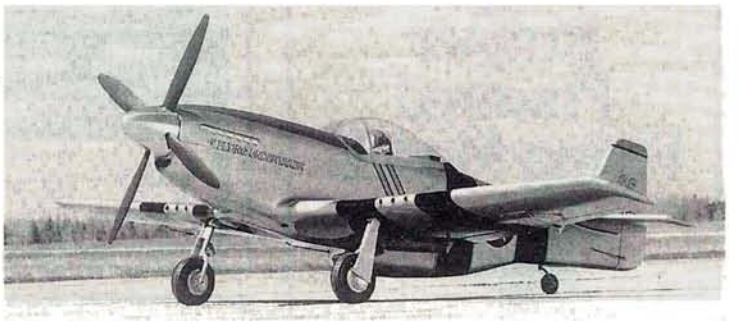
Product NEWS

JET MODEL PRODUCTS

Custom Jet Wheels and Tires

These 2-inch carbon-fiber and 2¾-inch machined-aluminum MAG wheels are light and durable. The wheels feature a 3/16-inch brass bushing for extended wear, and a unique two-shot injection process molds a stiff inner tire bead that locks onto the hub. To replace the molded rubber tire, simply loosen the lug nuts and separate the wheel halves. All tires and wheels come assembled.

Jet Model Products, 211 N. Mullen Rd., Belton, MO 64012; (816) 331-0356; fax (816) 331-3930.



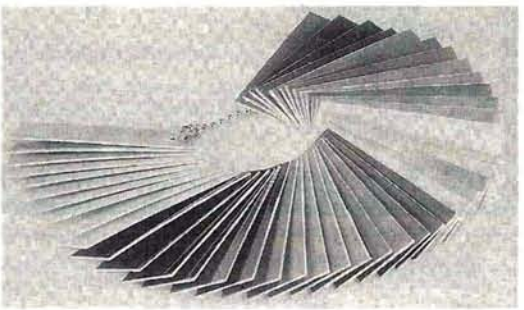
BALSA USA

P-51 Mustang

This kit features 32 precision die- and jig-cut parts; prebent landing gear and tailwheel assembly; all the necessary mounting hardware; a complete hardware package; molded wing fillets; four sheets of full-size, rolled plans; and a construction manual with 190 photos. Specifications: wingspan—75 inches; length—65 inches; wing area—960 square inches; weight—11.5 to 13 pounds; engine required—1.08 to 1.50 2-stroke or 1.20 to 1.50 4-stroke.

Part no.—416; **price**—$319.95.

Balsa USA, P.O. Box 164, Marinette, WI 54143; (906) 863-6421; fax (906) 863-5878.



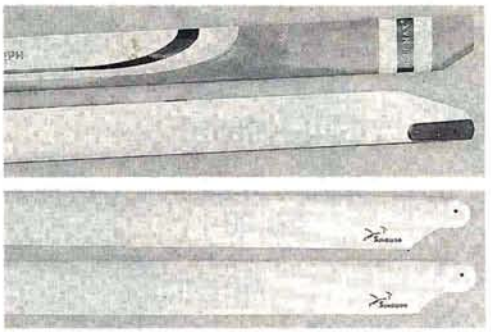
CARL GOLDBERG MODELS

Ultracote Sample Ring

With samples of all opaque, fluorescent and pearl Ultracote colors, this ring will help modelers to design trim schemes more easily. Each color chip contains the color number as well as the part numbers for Ultracote and Ultracote Plus.

Price—$5 (plus S&H).

Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651; (800) 6-FLYING; phone/fax (773) 626-9566.



HELI-MAX PERFORMANCE PARTS

Two New Rotor Blade Series

The new printed blades feature a decorative, three-color, factory-applied adhesive film covering and are made to fit .30-size helicopters. To aid in orientation, the color is only on the top side of the blades.

Made of carbon-reinforced fiberglass for strength and rigidity, the new carbon blades are semisymmetrical and finished in white gelcoat. Each blade is factory weighted and has a hollow center that reduces weight.

Prices—$34.99 (sport printed—515, 530 and 550mm); $29.99 (sport white—515, 530 and 550mm); $99.99 (carbon-fiber—525, 550 and 600mm).

Heli-Max Performance Parts; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; website: www.hobbies.net/helimax.

PROTO ONE LLC

Glow Spinner Starter

This self-contained, electric engine starter and glow driver includes a high-torque, planetary-gear reduction. It also has a charger and two drop-in, rechargeable batteries that deliver many engine starts on a single charge. Also included are instructions and a two-year warranty.

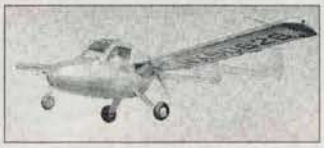
Price—129.95.

Proto One LLC, 435 S. Green Ferry Rd., Post Falls, ID 83854; (208) 777-7817; fax (208) 773-1862.

Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

Congratulations to Harvey Drinkwater of Swartz Creek, MI, for correctly identifying the August '98 mystery plane as the Anderson-Greenwood AG-14. A two-seat light cabin monoplane with a 34-foot wingspan and powered by a 90hp Continental C90 engine, the prototype first flew in 1947. It featured tricycle landing gear, excellent visibility and easy passenger and pilot entry and exit. The AG-14 could reach a maximum speed of 148mph and had a range of 450 miles. Only five production planes of this design were built, owing to engine-cooling problems and reduced propeller efficiency from disturbed airflow around the wing and fuselage.



Send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

CLASSIFIEDS

BUSINESS

PAYING $250 EACH for following toy metal outboard boat motors: Gale Sovereign 60hp, Oliver, Black Mercury MK-1000, Seafury Twin. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [12/98]

MAKE YOUR OWN ROCKET MOTORS!!! Homemade solid and composite fuels, power R/C gliders, model rockets, etc. Smoke tracers for R/C planes and choppers, electric igniters, cannon fuse "chemicals," lab acids. Glassware, "how to" books, videos, rocket motor kits; huge catalog $2. Pyrotek, P.O. Box 300, Sweet Valley, PA 18656; (717) 256-3087. [1/99]

FLY FOR REAL IN THE SAFEST, EASIEST-TO-FLY AIRCRAFT IN THE WORLD. Learn to fly in one day, build or buy used, no licenses required. Powered Parachute Newsletter. Lots of good information on powered parachutes, featuring the largest collection of used powered parachutes for sale in the world! $20 annual subscription, 4 issues. Visa or Mastercard. Portland Powerchutes Inc., 28621 S.E. Woods Rd., Eagle Creek, OR 97022; (800) 457-4310. [12/98]

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TILT WING V/STOL AIRCRAFT

BOB KRESS, retired vice president of Grumman Aerospace, has been designing and testing V/STOL (vertical/short takeoff and landing) aircraft for over 30 years. His recent endeavor is a "feeder-line" tilt-wing aircraft capable of conventional and vertical takeoffs and landings. Feeder-line aircraft service smaller airfields with regular service to larger metropolitan airports.

The ideal aeronautical solution to this form of "people transport" is to be able to ascend vertically, like a helicopter, but also have the speed of a conventional turboprop, and practical aircraft to accomplish this have long been sought. The V-22 Osprey has great load-carrying capability (cargo or passengers) but is still relatively slow, and it cannot land conventionally. The rotors are much too large to remain horizontal without striking the ground.

The forward-swept wing (FSW) V/STOL concept shown in the pictures will provide rapid service—into and out of larger airports or remote areas, with or without runways. The propellers are small enough to clear the ground with the wings in the "down" position. The "all-flying" wingtips will provide pitch and yaw control. Roll control during hover will be implemented through differential power and/or thrust-spoiling devices on the nacelle.

Since complete control of the vehicle can be accomplished with aerodynamic devices, no tail rotors (horizontal or vertical) or cyclic-pitch main rotors need be employed. That alone makes this concept stand out from other tilt-wing and tilt-rotor-type V/STOL aircraft.

The test model was built to demonstrate the ability to hover and maneuver such an aircraft using aerodynamic devices alone. Construction with conventional model materials (balsa and foam) and use of off-the-shelf propulsion and guidance systems were also a requirement.

Originally conceived as a single, internal-combustion-engine model with the engine driving two large-diameter model propellers via belts, the vehicle was quickly converted to an electric-powered model when overheating of the engine became a time-consuming problem to solve. The model, in its current state, uses two Aveox 1415/4Y brushless motors and controllers. The motors are mounted to Robbe 3.7/1 planetary gearboxes, which in turn drive 22x10 (modified) Zinger props. Thirty cells per motor provide the necessary thrust to lift this 20-pound model into the air. Hover current is near 30 amps, and maximum power is a little over 40 amps. Hover flight times on 2000mAh cells are a little under 3 minutes—sufficiently long to investigate flight qualities.

The model has gone through many "design" changes to optimize stability and control in the hover mode. Various-size outer wing panels, roll-control vanes, fences and even "tuft" studies have been done to fully understand the problems and advantages of this type of control scheme on a V/STOL aircraft.

—Tom Hunt